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MITI SURVEY REPORT ON CONCEPT OF ESTABLISHING INTERNATIONAL TECHNOLOGY EXCHANGE BASE IN TOKAI REGION

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93FE0015 Tokyo CHUBU BUREAU, MINISTRY OF INTERNATIONAL TRADE AND INDUSTRY in Japanese June 92 pp i-64

[Survey Report by Chubu Bureau of MITI]

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[Text] **Introduction**

As Japan's economic activities have become increasingly globalized in recent years, we begin to feel very strongly that the level of international cooperation and contribution provided by Japan should justify its present place in the world as a major economic power. We regard it as our duty to participate in and to contribute to the international community through our creative achievements in the fields of international science and technology, in the promotion of the smooth distribution and transfer of such technologies, and in the exchange of balanced technical research with the United States and European countries, while, in addition, providing positive support and cooperation essential to sending the developing nations on their way to gaining self-sufficiency in the fields of science and technology.

In this context, the Phase Four of the Nationwide Development Plan, whose basic goal is to achieve a multipolar distribution-type land formation, defines the role of the Tokai Region (Aichi, Gifu, and Mie Prefectures) as "one of integrating world-class R&D functions related to various leading industrial fields and bolstering information and international networking, thereby serving as a pivotal area in industrial technology." Moreover, in the report entitled, "In Search of New and Rapid Progress in the 21st Century Tokai and Hokuriku Regions—Plans for the 21st Century 'Sphere' Central Japan,"(prepared by the Chubu Bureau of the Ministry of International Trade and Industry in June 1989), expressing regional industrial and economic concepts and visions, "the concept of a global communication base" aimed at forming the present Ise Bay Region into Japan's leading international networking and information transmission dispatch base, has been proposed.

Furthermore, the Tokai Region, whose share of Japan's industrial production is 15%, is leading the world in the accumulation of industrial technologies and is expected to play a major role in the development of economic societies both in Japan and on a worldwide base. In this connection, special efforts will be made in promoting techno-globalization.

For this reason, insofar as its contribution to international society is considered, it is deemed necessary that, by utilizing the accumulation of advanced industrial technologies, especially production technology which often is considered an excellent regional resource, the Tokai Region should work on the idea's realization by taking into consideration the basis for autonomous regional development, by accelerating internationalization, and by promoting industry and technology.

In view of the foregoing, in the capacity of a private advisory organ for the director of the Chubu Bureau of the Ministry of International Trade and Industry, a "Research Group whose goal it is to give concrete form to the concept of international technology networking (the Dandelion Project Research Forum)" has been established. Thus far, this research group has been studying means for realizing the idea of an international technological networking base.

This report puts together the results of this study.

List of Members of the Research Committee on Realization of the Concept of an International Technology Exchange Base (arranged by Japanese alphabetical order; Mr./Mrs./Miss designations omitted)

Hajime Akutsu, executive director, Chubu Economic Federation
Takeshi Izumi, head of Tokyo Office, International Federation of Industrial Development Agency
Nan Ichikawa, head of Aichi Prefecture Commerce and Industry Division
Yukio Otsu, head of Mining Industrial Planning and Survey Division, Japan International Cooperation Agency
Kyo Ohara, managing director, Chubu Industrial Federation
•Eiji Ogawa, Dean of Graduate School of International Development Research, Nagoya University.
Shozo Kumagaya, CEO of Maruta Chinaware K.K.
Yu Saito, Professor of Economics, Chuo University
Hiroshi Sakagami, director and head of Planning Section, Chubu Electric Co., Ltd.
Yasuyoshi Suzuki, executive director, Chubu Industrial Vitalization Center
Masahiro Takagi, director and manager (formerly domestic affairs manager) of the Association for Overseas Technical Scholarship
Hirohito Tonai, chief of Nagoya Economic Bureau
Akihito Naito, president and executive director of Rinnai Co., Ltd.
Shozo Hibino, Professor of Sociology, Chuo University
Takayuki Hirota, CEO of Hirota K.K.
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Morio Arakawa, head of Development Department, Toyoda Tsusho Kaisha, Ltd.
Kakuo Kimura, deputy director and general researcher, Mie Prefecture Industrial Technology Center
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Shizuka Kondo, research supervisor, monitor, Aichi Prefecture Industrial Technology Center
Tadayuki Sakaguchi, deputy director, Gifu Prefecture Industrial Technology Center
Takayasu Shigeta, director of IATSS Forum, Industrial Association of Traffic and Safety Science
Keiichi Shinoda, head of General Affairs Department, Nagoya International Center
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Kiyoshi Tate, head of Training Department, International Environmental Technology Transfer Research Center
Shonosuke Nagata, chief of Planning Division, General Affairs Department, Toyota Motor Co., Ltd.
Osamu Hamada, director of Chubu Training Center, the Association for Overseas Technical Scholarship
Morihiko Hayashi, head of Planning Division, Nagoya Municipal Industrial Research Institute
(Koichi Mizuno)
Akira Mizuno, assistant professor, Technology Development Center, Toyohashi University of Technology
•Motonari Yamada, assistant professor of Economics, Nagoya University

Note: Names in parentheses represent former committee members;
• Denotes committee chairman.

Research Committee on the Realization of the Concept of an International Technology Exchange Base—meetings held:

First meeting : 22 October (Tuesday) 1991
Second meeting: 21 February 21 (Friday) 1992
Third meeting : 1 June (Monday) 1992

Specialization Subcommittee, Research Committee on the Materialization of the Concept of International Technology Base meetings held:

First meeting : 1 December (Monday) 1991
Second meeting: 31 January (Friday) 1992
Third meeting : 11 March (Wednesday) 1992
Fourth meeting: 1 June (Monday) 1992

On the Designation of a Forum Organized for the Realization of the Concept of International Technology Exchange Research

Designation: Dandelion Project Research Forum

English Translation: Technology Aid (Assistance, Advancement) Networking Project with Open Partnership/Organization

Reasons for Choosing this Particular Designation:

1. The dandelion is a plant widely spread throughout the world. Its fruit has an umbrella-shaped white-feather-like crown on its top and is scattered by the wind. This image is a perfect symbol for the various ways in which technology is transferred and exchanged across the globe.

2. The scattered fruit takes root deep in the ground, and many leaves emerge from the side of the root. This image, accordingly, is a perfect symbol for the transfer of technology which plants its roots deeply in the soil of regions receiving them .

3. The root is lodged deeply in the ground and the plant's leaves grow in clusters like a rosette. This image is a perfect description of the ways in which a technology exchange base is constructed.

4. Both the flower and the root of the dandelion are used in various kinds of Chinese medicines (to treat fever, to induce perspiration, and to act as a peptic medicine). We can connect this aspect of the dandelion to the various technologies useful for a country, a region, or an industry.

5. Although dandelions come in huge varieties, those most frequently seen in cities in recent years originated in Europe. This phenomenon is analogous to the fact that Europe, a birthplace of wide varieties of technologies, also is where Japan's technology (and those of other parts of the world) had their origins.

Reference:

- English Name: Dandelion
  Etymology: French word, dent de lion, a lion's teeth
- Flower language: a provincial oracle; a flower which sends a happy message.

Chapter 1. Situations Surrounding International Technical Exchange

Section 1. Economy: Globalization of Economic and Scientific Activities

(Economic Activities Which Are Becoming Increasingly Globalized)

As indicated by the rapid expansion of trade, investment, and finance, the world's economic activities in recent years have been developing on a global scale, increasing the degree of economic interdependence among nations.

Such globalization of economic activities is beginning to show the effects which a given country's domestic policy and systems can have on other nations involved. As a result, it is becoming increasingly necessary for the international community to establish basic economic rules applicable to all nations and for each country itself to build a domestic economic policy and structure which are not in conflict with such international rules.

In fact, in order to construct a sound foundation for the development of a world economy, at GATT (General Agreement on Tariff and Trade) (where corrective measures for trade restriction are discussed) and ACCEDE meetings, as well as at economic summits (where major world leaders meet), the international community has been working toward building an international order covering broad areas, including internationally harmonious economic policies acceptable to all nations involved and to their economic structures.

(Progress in Globalization Also Made in Scientific and Technical Activities)

As economic wars were waged and intensified between nations, the countries involved increasingly became aware of the fact that science and technology were nuclei of economic power, and they began aggressively pursuing research and development in scientific and technological fields. The leading industrial nations are steadily increasing their spending in science and technology related areas in order to strengthen their research capabilities as well as to pursue the development of research manpower to support their scientific and technological policies and vitalize their industry's efforts aimed at development of new products and new technologies.

Moreover, ever-expanding activities in transborder patent applications, international research exchanges, and international trading of technologies are indicative of the rapid pace of globalization of scientific activities furthering scientific interdependence among the world's nations.

In the midst of the developments in globalization of scientific and technical activities and a technological revolution, the following developments are taking place:

(1) As a corrective measure dealing with economic disparities between the North and the South, the transfer of technology to the developing nations and the pursuit of economic cooperation with them are becoming increasingly important.

(2) A similar framework must be provided, enabling both individual researchers and private industry in each country to deal with their own R&D matters, if international harmony is to be maintained and problems arising from differences in systems and practices of the various countries are to be resolved. These problems include both intellectual property rights and technical standards.

(3) The so-called "mega-science," the scientific and technological activities in fields dealing with global environmental problems, in space development, aerospace technology, oceanography, and earth sciences, requires a huge amount of R&D spending and recruitment of researchers from a wide variety of fields. As the importance of such undertakings (which are beyond the capability of any one nation) increases, the need for international cooperation becomes ever more pressing.

As the need for international contributions and cooperation through scientific and technological activities increases, expectations are high that Japan will play a central and vital role in promoting international technological exchanges among nations in the world.

(Expansion of International Technological Exchanges on Both Government and Private Sector Levels)

As globalization of economic and scientific/technological activities advances, Japan's international technology network expands on both governmental and industrial levels.

The 1991 science and technology white paper places Japan's scientific and technological level approximately on the same level as that of the United States in the fields of materials, information technology, and electronics, even in the area of basic research. This achievement is attributed to its aggressive R&D efforts, installation of overseas research institutes and employment of foreign researchers, and the introduction of technologies from advanced countries, especially the United States and European countries. In new technological fields (new materials, semiconductor devices, optoelectronics, etc.) which hold great promise for the future, correspondingly, a superior position for Japan is predicted.

In the area of international trade of technology, for a long period of time, importation of technology has far exceeded exportation. However, from the microeconomic standpoint, the trend for international expansion is serving to adjust the balance between revenue and expenditure. However, the past pattern of the international trade of technology, importing advanced technologies from the United States and Europe and exporting steel, chemical, and textile technologies to Asian countries still remains unchanged. Thus the imbalance of technology trade with the United States and Europe continues to remain substantial.

Moreover, although since 1986 the exchange of research engineers has rapidly increased, a majority of those leaving Japan is heading for the United States and Europe, while the incoming flow of research engineers originates mostly in Asia, presenting a pattern very similar to that associated with technology

trade. Thus a significant imbalance remains, contributing to Japan's substantially lower level of achievement when compared with those of the United States and Europe in terms of the number of research papers produced and the distribution of information.

As indicated by the foregoing, Japan had to depend mostly on the basic research produced by the United States and Europe to construct its own scientific and technological foundation on which today's scientific and technological activities are based. In view of the fact that, today, high international esteem is accorded to Japan's scientific and technological achievements as had been the case in economic sphere, Japan should play a major role in the international development of science and technology by ensuring that exchanges in the fields of science and technology with the United States and Europe will not be one-sided and that, in order to achieve autonomous development of non-industrialized nations, Japan should vigorously support and cooperate with the developing nations in their endeavor to develop technologies.

Table 1. Japan's Scientific and Technological Achievements in International Context (1991 Science and Technology White Paper)

Item	Description
Research level according to U.S.-Japan surveys	Basic Research: United States superior in many fields except in materials (crystal structure control) and information-electronics (high performance elements, voice-images) •Europe about equal though this depends on field. Industrial Technology: United States and Japan about equal in materials, information-electronics-production fields. Japan gaining faster in future technological level.
Technology trade	•Exports ¥329.3 billion, imports ¥329.9 billion (1989), revenue/expenditures balanced (largely due to an increase in export of automobiles). •Technology imports from United States and Europe and exports mostly to Asia; this pattern persists.
Exchange of researchers	•"From Japan to U.S." far exceeds "from United States to Japan." •Short stay: about 5 times greater (Japan to U.S., 10,461 U.S. to Japan, 1,966) •More than 1-month stay: 2.4 times greater (Japan to U.S. 1,574; U.S. to Japan 657)
Production of research papers	•Number of papers produced less than 1/2 of those produced by U.S./European researchers (0.08 per person) •Number of research papers cited in foreign papers—Japan vs. U.S./Europe: Japan 1/4 of U.S/Europe (3.4% when shared)
Internationally coauthored papers	•Some coauthorship with U.S. researchers
Distribution of information	•Hardly any access to Japanese databases; dispatch function weak.
International cooperation	•Ranked first in sharing the budgetary load of UNESCO; low-ranked insofar as contribution of manpower is concerned. •Proposed and implemented joint research in Human Frontier Science Program (HFSP) and Intelligent Manufacturing System (IMS).
Private industry's activities	•Total of 276 overseas R&D bases (two companies with capital of +¥50 billion; one company already established) —hiring of foreign researchers at Japanese companies' R&D bases rapidly increasing. •24% of Japanese firms either fund or contract overseas universities in undertaking research projects •At domestic R&D bases, 751 foreign researchers hired represents less than 1% of the total; an increase in Asians especially noticeable, representing 53% of total foreign researchers (1990)

Section 2. How Japan Is Dealing With International Developments in Conducting Scientific and Technological Activities

(Creation, Distribution, and Transfer of Science and Technology)

In terms of its economic and technological power, Japan already is occupying the position of a world leader, and the international community expects Japan to play a leading role in solving various problems on a global scale and in achieving a harmonious development in the international economic society.

As globalization of science and technology fields advances, in order to continue its own development on a stable basis, a resource-poor country like Japan must put forth major efforts in achieving innovative science and technology and in overcoming those problems of the global environment which are shared by all mankind. Promotion of science and technology must be pursued from a long-range viewpoint, using an integrative and dynamic approach.

Moreover, in order to create science and technology, to promote their dissemination and transfer as smoothly as possible, and to develop and expand still further joint international research and the exchange of human resources, efforts to improve the overall system, including a new technology exchange channel outside of the scope of present marketing mechanisms becomes important.

(Variety of Ways in which to Deal with Scientific and Technical Activities)

In the midst of the globalization of scientific and technological activities, Japan has proposed the following ideas which appeared in the 1991 Science and Technology White Paper: "To share the fruits of basic research with other countries, treating the knowledge gained as intellectual assets to be shared by all mankind," "the effective utilization of technology stressing its values as international community assets," and "worldwide cooperation in dealing with the growing-scale and the expansion of scientific and technological activities." A wide variety of ways in which these ideas are dealt with are listed below:

(1) Strengthening the system of sending and receiving researchers to and from foreign countries by national and academic R&D organizations.

- Acceleration of research networking and joint research based on the method of research networking acceleration.

(2) Advancement of joint international research

- Basic research designed to analyze bio-functions (Human Frontier Science Program), the Research Development Corporation of Japan's Joint International Research Project, implementation of Intelligent Manufacturing Systems (IMS) designed to develop advanced manufacturing systems, the fusing of intelligent machines and human beings, and the installation of joint international research at universities.

(3) Construction of a Research Base Abroad

- Installation of a large infrared ray optical telescope in Hawaii by the National Astronomical Observatory.

- Joint research conducted with Cambridge University and University of London (both in England), and with Michigan State University (USA) as part of the Research Corporation of Japan's international research exchange promotional project.

(4) Cooperation with International Organizations

- Contribution to UNESCO, WHO (World Health Organization), IAEA (International Atomic Energy Agency), and ITU (International Telecommunication Union) in the form of funds and manpower.

(5) Cooperation with Developing Nations through ODA

- Technical cooperation is being implemented through the U.S.–Japan science and technology agreement and through other similar agreements, as well as through ODA which provides technical aid and cooperation to the developing nations.

Japan's contribution to ODA for the fiscal year 1990 was $9.1 billion (not taking into account $15.3 billion allocated to Eastern Europe), ranking second in the world after the United States in terms of amount contributed. Of these contributions, the amount allocated to the areas of technical cooperation, including participation in surveys, sending specialists abroad, receiving trainees, and expanding cooperation in research, was $1.3 billion (14.7% of the entire ODA budget), which is lower than the levels maintained by the United States ($2.1 billion), France ($2.6 billion), and Germany ($1.5 billion).

As indicated by the foregoing, not only the measures taken by government but also activities of private sector in international development were stepped up with respect to installation of overseas research bases, technology transfers to developing nations, and joint research involving overseas researchers and organizations. However, further efforts in solving the problems encountered in international technology exchanges and in achieving smooth implementation with regard to the creation, dissemination, and transfer of science and technology are recognized as essential.

Especially, in order to accomplish effective increase of the international flow of these exchanges to meet the diversified needs of various countries, it will be necessary for private industry and regional organizations, possessing internationally high-level technologies, to play a major role. Excellent potentials of industry, technology, tradition, and culture must be utilized while dealing with these diverse needs in minute detail.

Chapter 2. Present State of International Technology Exchange in Tokai Region and Attendant Problems

Section 1. Characteristics of Tokai Region

(Heavy Industries and Accumulated Technologies)

The Tokai Region (Aichi, Gifu, and Mie Prefectures) long has dealt with technological developments which effectively utilized such materials as wood, yarn, clay, and iron. Using such local industries as textile and porcelain manufacturers as a foundation, the region has achieved a highly-developed assembly industry in the manufacturing areas of textile machines, machine tools, automobiles, aerospace, and fine ceramics. Moreover, the region, known as a birthplace of the "kanban method," excels in mechatronics, production technology, and process-control technology. Its accumulation of industrial, technological, and human resources has made it possible for the Tokai Region to play a leading role in "Techno-State Japan."

(Historical and Cultural Background)

Forming the background of such an accumulation of industrial and technological resources are the more traditional industries, producing ceramic wares, dyes, wood working, and cutlery, together with a technological heritage which produced puppets, for example, and which has been handed down from generation to generation. Such historical and cultural backgrounds formed today's industrial base in the Tokai Region. What this means is that, when viewed from a worldwide perspective, the Tokai Region presents the image of Japan in miniature. Consequently, it is the best region which one could select if seeking to understand the overall picture of Japan.

(A Region with a Space to Breath)

Today, when ill effects of high concentration of various functions in Tokyo is being pointed out by many, the Tokai Region is maintaining its living environment with ample space in which to breath. Its city planning, one of the best in Japan, emphasizes spaciousness provided by the city and a well-planned network of roads. As a result, life here has a certain kind of charm and comfort. In addition, a succession of world-class cultural facilities are being built. Moreover, making most of its rich natural resources, viz., Kiso Sansen, Ise Shima, and the Japan Alps, the region also provides a wide variety of resorts and leisure facilities, offering a well-equipped space of great charm for leisure activities.

Moreover, in this area, the structural adjustment and augmentation of research and development functions are proceeding nicely. At the national level, those attached to academic institutions include the Nuclear Fusion Science Research Institute, the Okazaki National Joint Research Organization, and the Government Industrial Research Institute, Nagoya. Private research organizations include the Fine Ceramics Center (a foundation); the Nagoya Laboratory of the Superconductive Engineering Research Institute, the International Superconductive Industrial Technology Research Center; and the Gifu Center of

the Super-High-Temperature Material Research Center, Inc. In addition, Micro Gravity Laboratory (MGLAB) is scheduled to be in full operation in 1993, and revamping of Nagoya City's International Design Center is in progress. These facilities will be open to the international community and will play a major role in international technology exchange. Further bolstering of R&D functions is expected.

Also planned is construction of three research university cities in the western part of Eastern Mino, in the eastern hills of Nagoya, and at the foothills of Suzuka. These cities will constitute bases for academic and R&D activities, centers where all R&D functions in this region will be brought together, serving as "saucers," so to speak, to attract and contain those functions.

(In Step with Advancing International Exchange, To Reorganize and Improve Basic Foundations)

Nagoya City's Convention facilities also are being revamped. Nagoya City International Conference Hall is one of Japan's foremost sites for meetings with a seating capacity of 3,000. It is equipped with medium- and small-sized conference rooms to accommodate a large number of subcommittee meetings. In the city center, construction of world-class hotels is gathering steam, and the city, in recent months, has seen the number of reservations for international conferences rapidly increasing.

As for the transportation bases, beginning with the structural adjustment project for the entire second Tomei and Meishin Expressways recently decided upon, the possibility of a new Chubu international airport, which will be under study by the sixth 5-year airport improvement project, as well as the concept of a high-speed traffic network, which includes a linear Chuo Shinkansen, is expected to see some progress.

(Positive Approach Required in Dealing with Regional Internationalization and International Contributions)

In the meantime, internationalization in the region and contributions to the international community are being handled actively not only on the individual company level but on the regional level as well.

For instance, "Toyota's International Concept" deals with a motor city, Toyota, whose goal is the formation of an international transmission and receiving base of information on industrial technology-related research. The "Concept of a Science and Technology Exchange Center" of Aichi Prefecture is a leading project of the Aichi Academic Research and Development Zone designed to construct a composite base for research exchange, education and training, and joint research involving industry and academic sectors. The "Concept of Shidanmi Human Science Park" aims at achievement of an international brain integration base, and "Toyohashi Science Core" will be constructed as a nucleus facility of the "Science Create 21 Plan" for technical transfers and joint research in partnership with national universities. In Gifu Prefecture, currently under study is a policy for pursuing international technical

cooperation. In addition, a proposal presently being prepared will deal with the question of how the exchange and support systems, designed to utilize the technology and human resources of medium- and small-sized businesses effectively within the prefecture, should be set up. It includes an examination of the policy of forming a partnership with the United Nations Industrial Development Organization (UNIDO). In the meantime, at Nagoya University's Graduate School, beginning in 1991, a new international research and development department will be established. Its objective will be to train experts who will provide assistance and cooperation in achieving sound development of non-industrialized nations. In Suzuka City in Mie Prefecture, plans for establishing Suzuka International University with the objectives of providing an open education to full-fledged members of society and to children returning from abroad (where they received education), and foreign students, as well, are under consideration.

Moreover, in Mie Prefecture, International Development Technology Transfer Research Center, a foundation serving as a Japanese base for the transfer of environmental technology to developing nations, was established in December 1990, generating a great deal of activity in this area. Full-scale training facilities currently are under construction to serve as one of the nucleus facilities of Suzuka Foothills Research University City.

Section 2. Present State of International Technology Exchange in the Tokai Region

This section analyzes the present state of international technology exchange involving the Tokai Region's public and private organizations, using results of surveys and bearing in mind the characteristics of the region as described in the first section.

With advancing globalization of industrial activities and with improvement in Japan's own international position, the region's growing international technology exchange activities are becoming more diversified. For this reason, we have classified the category of international technology exchange into six sections, defined as follows:

(1) Importation of Technologies: To receive patents, "technical know how," and guidance from foreign industries;

(2) Exportation of Technologies: To offer private industry's patents, technical know-how, and technical guidance to overseas concerns;

(3) Technical Cooperation: In cooperation with ODA and in support of both domestic and foreign public policies, to provide the expertise of specialists and to participate in Japan Overseas Cooperation Volunteers;

(4) Technical Training: To accept and train overseas trainees who come to Japan for the specific purpose of acquiring technology;

(5) Research Collaboration: To cooperate with and support ODA and domestic and foreign public policies in the area of overseas R&D endeavors; and

(6) Joint Research: R&D conducted on a joint theme benefiting all participants (other than those specified in the above-mentioned research cooperation category.

(Survey Results)

This survey was conducted among the industry and business groups in the Tokai Region. ("Survey Questionnaires concerning Promotion of International Technology Exchange, Industries, and Technologies in the Tokai Region." The survey was conducted during the period, November-December 1991, among 1,417 people (of these, the number of valid responses received was 560).

Industry's performance in international technology exchange is as follows: the largest number of companies (145 companies—34.7%) replied that they have experience in this area, followed by 139 companies (33.3%) which have experience in exportation of technology, and 98 companies (23.4%) in importation of technology. In comparison with these, the figures obtained in technical cooperation, 65 companies (15.6%); in joint research, 28 companies (6.7%); and in research collaboration, 13 companies (3.1%) are relatively small.

Examination of the present number of foreign residents and international training organizations, and the present state of acceptance of technical trainees by the public sector, including universities, in the Tokai Region, indicates (as shown in Table 2) that those above the scale of total regional production (approximately 10% of the national figures) in terms of training of overseas trainees, as shown in Table 2, are in the order of the International Center for Environmental Technology Transfer 2 (ICETT), a foundation; AOTS, a foundation; and [Oiska] Industrial Development.

International technology exchange in the Tokai Region, therefore, shows a trend toward the specialization of technical transfer as defined broadly, encompassing both technical training and exportation of technology.

Table 2. Present State of International Technology Exchange in the Tokai Region and the Public Sector

Division/Item	Breakdown/ description	Tokai share (%)	Real number (people)		Remark
			Tokai	Japan	
(1) Foreign resident	Researchers	3.9	38	975	End of 1990 Foreign resident statistics
	Technologists	3.9	133	3,398	
	Skilled personnel	6.2	183	2,972	
	Transfer within a company	3.5	52	1,488	
	Trainee	11.9	1,572	13,249	
	Settled labor force	9.1	4,962	54,359	
	Student	4.2	1,502	35,595	
	Foreign student	4.9	2,383	48,715	
(2) International technical training organizations	JICA	5.2	250	4,821	1989
	AOTS	11.6	338	2,907	1990
	ICETT	100.0	18	18	1991
	Oiska	43.7	62	142	1988
(3) ODA-related undertaking	Overseas technical trainees Japan	4.8	21	433	1990
	Overseas cooperation volunteers	6.8	62	911	
(4) University	Academic exchange agreement	7.8	161	2,073	1990
(5) Industry	Foreign capital businesses	1.6	49	3,088	1991

Note: Sources of materials: (3) Foreign Ministry; (4) Ministry of Education; (5) General Guide to Foreign Capital Companies
JICA: Japan International Cooperation Agency; AOTS: Association for Overseas Technical Scholarship; ICETT: International Center for Environmental Technology Transfer (above performance is based on a single project); [Oiska: Oiska Industrial Technology Development Cooperation Group.]

1. Present State of the Exportation of Technology, Technical Training Scholarship, and Technical Cooperation

(Procedures for Acceptance of Technical Scholarship Trainees Implemented by Public Agencies

Major agencies located in the Tokai Region are the JICA, the Nagoya International Training Center, AOTS, the Chubu Training Center, and ICETT. (See Tables 3, 4, and 5)

The JICA Nagoya International Training Center opened its doors in March 1970 as one of the JICA Training Centers located at selected cities in Japan. As a part of the national project, the center has been receiving technical scholarship trainees from abroad at the request of foreign government. Trainees for the most part are civil servants or staff members of government-affiliated organizations. After their orientation has been completed, trainees then will take specialized courses at public research institutes, at universities, and in private corporations. Moreover, the entire training costs are defrayed by the Japanese Government.

The AOTS Chubu Training Center was established in October 1970. Trainees received by this center, for the most part, are technical personnel from business firms. The objective here is to train plant site technicians to meet the needs of Japanese companies entering overseas markets and which are constructing plants abroad. The request to the AOTS comes from affiliated private business corporations. The government subsidy is given to cover their transportation and living expenses.

ICETT was established in October 1990 as a public utility corporation authorized by the MITI minister. Utilizing the superb environment protection technology possessed by the petrochemical combination industry in the Yokkaichi District, ICETT serves as a base for the transfer of the kind of industrial technology useful in environmental protection to various foreign countries and related R&D activities. Improvement in the present facilities is in progress with the target date set for October 1992. Their principal undertaking consists of the provision of training at the request of JICA and of joint training with AOTS.

Thus, taking advantage of the substantial layers of accumulated heavy industrial technologies existing in the region, the Tokai Region has developed technical programs conducted by public agencies. However, the capacities of both JICA and AOTS facilities are limited. In addition, their aging bathroom and toilet facilities are wholly inadequate. As the ODA budget increases and as business firms' entry into overseas markets gathering steam, it is feared that these agencies alone, as matters now stand, will not be able to meet the ever-increasing needs of training programs.

(Diversification of Technical Training)

Under terms of the revised Immigration Control and Refugee-Recognition Act, the activities of agencies accepting technical scholarship trainees are becoming increasingly diversified.

In the past, training programs, for the most part, were conducted either by/through national government-affiliated agencies, such as JICA and AOTS. These training programs were either directly or indirectly participated by the national research laboratories, forming a network involving public research laboratories, academic institutions, and private industries, thereby offering a wide range of assistance and cooperation in implementing training programs.

Moreover, now that the revised Immigration Control and Refugee-recognition Act has become effective, MITI's "Project for Joint Acceptance of Technical Scholarship Students from Abroad" now allows private groups, such as cooperatives, chambers of commerce, and commercial organizations, to accept trainees on their own.

To facilitate the matter still further, JITCO (Japan International Technical Cooperation Organization) was established in October 1991, to provide support to the acceptance of technical scholarship students from abroad into the technical training programs.

Moreover, in October 1991, JITCO was established to provide support to acceptance of technical scholarship trainees from abroad.

Table 3. Performance Record of the Region's Leading International Agencies Accepting Technical Scholarship Trainees From Abroad

(1) JICA—Nagoya International Training Center: 1990

Group course titles	Actual No. of students
Thermal process technology	16
Assembly machine industry II	10
Surface reformat technology II	6
Welding technique	10
Porcelain development utilization technology	8
Bioindustry	10
[illegible in source] production technology	10
Medium/small size business development seminar	15
Electric business management	10
Advanced use of wooden materials	7
High casting technique	10
Ceramic construction material technology	8
Fine ceramic application technology	9
Production process management techniques	7
Metal working in high grade product	8
High-temperature construction materials application technology	8
Medium/small business diagnostic technology	11
Medical technology	22
Continuous control technology for the electric furnace	8
Modernization of distribution	7
Fire prevention technology	5
Total	205

Note: In addition to group training courses, individual courses were given to 77 trainees.

[continued]

[Continuation of Table 3]
(2) AOTS—Chubu Center: 1990

	Training course titles	Actual No. of students
General training course	13-week course	
	6-week course	150
	3-week course	37
	2-week course	10
	52-week course	25
	1-week course	41
	Total	263
Management training course	Top management seminar	
	Business management training	
	International management training	
	Quality control training	
	Quality control training	
	Production control training	21
	Chinese management training	
	Medium/small company plant management training	
	Individual medium/small company management training	
	Individual quality control training	
	Individual export/import business training	
	Training of Chinese finance and treasury officers	
	Training of Chinese management for construction materials industry	
	Hungarian business management training	
	Polish business management training	
	Hungarian production control training	
	Total	21
Total		284

[continued]

[Continuation of Table 3]
(3) ICETT (International Center for Environmental Technology Transfer)

Group course titles		Actual No. of students	Remarks
1990	Industry process [illegible in source] process and heat usage technology	10	accepted by JICA Mexico
1991	Industrial process [illegible in source] process and heat usage tech.	7	Accepted by JICA
	Industrial pollution prevention technology	10	Accepted by JICA
	Air pollution prevention technology	10	Accepted by AOTS (China)
	Air pollution prevention technology	10	Accepted by AOTS Poland, Hungary
	Air pollution prevention technology	10	Single company project
	Environmental protection technology	20	Single firm project
Total		77	

Table 4. Comparison of JICA Training Centers

		Tsukuba International Center	Tokyo International Center	Tokyo International Training Center	Hachioji International Center	Nagoya International Center	Osaka International Center	Hyogo International Center	Kyushu International Center	Okinawa International Center
Opening date		1980.3	1988.1	1985.6	1976.6	1971.3	1967.4	1973.8	1989.3	1985.4
Building scale (m²)	Lot size	20,403	3,892	10,013	5,240	3,305	3,022	3,728	13,000	33,000
	Total floor area	10,145	11,303	18,868	4,767	3,768	2,415	4,301	10,905	5,152
No. of training courses (1990)		15	16	87	29	22	26	9	33	25
No. of trainees (1990)		158	201	915	316	206	229	68	269	239
No. people who can be accommodated (1990)		200	80	461	100	100	62	78	150	110
Past record of accommodations used (%)		79.4	71.2	85.4	74.0	67.9	65.6	82.8	61.1	87.9
Primary facilities	Private room Single	190	60	421	94	92	58	66	140	90
	Private room Twin	5	10	20	3	4	2	4	5	10
	Bath	Yes	Yes	Yes	Yes			Yes	Yes	Yes
	Shower					Shared	Shared			
	Toilet	Yes	Yes	Yes	Yes	Shared	Shared	Yes	Yes	Yes
	Telephone	Yes		Yes						
	TV		Yes							
	Classroom	7			5	7	3	4		
	Audiovisual room	Yes				Yes				
	Computer room	Yes								
	Front	Yes			Yes	Yes	Yes	Yes		
	Lobby	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Dining room	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Lounge	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes
	Conference room	Yes	Yes	Yes						
	Library	Yes	Yes	Yes	Yes	Yes			Yes	Yes
	Video room	Yes	Yes	Yes						
	Gymnasium	Yes							Yes	Yes
	Tennis court	Yes			Yes	Yes			Yes	Yes
	Swimming pool	Yes			Yes					Yes
	Music room	Yes								
	Training room		22	22					Yes	Yes
	Seminar room		5	21						
	Conversation corner		Yes	Yes						
	Typing room		Yes	Yes		Yes		Yes		
	Recreation room		Yes							
	Audio room		Yes	Yes					Yes	Yes
	Auditorium			Yes		Yes		Yes		
	Briefing room			Yes						
	Billiard room			Yes						
	Stereo room				Yes					
	Sports room				Yes	Yes			Yes	Yes
	Japanese-style room					Yes				
	Gymnasium									
	Medical office						Yes			
	Laundry room						Yes	Yes		
	Technical workroom								Yes	
	Personal computer room								Yes	
	Orientation room								Yes	Yes
	L L classroom									Yes
	Computer training room									Yes
	Audiovisual " "									Yes
	PC self-learning room									Yes
	Ground									Yes

Note: No. of training courses and participants represents past record of group training still to be verified (except those continuing from previous years)

Table 5. Comparison of AOTS Training Centers

		Tokyo Training Center	Yokohama Training Center	Kansai Training Center	Shrinkansai Training Center	Chubu Training Center
Opening date		April 1982	April 1989	October 1964	April 1994	October 1970
Building scale (㎡)	Lot size	5,117	11,780	3,888	10,000	5,136
	Total area	9,570	13,552	3,716	14,000	2,193
Number of training courses (1990)		47	60	37		22
Number of trainees (1990)		748	975	505		301
Number of boarders (1990)		200	300	122	300	78
Accommodation usage (1990: %)		86.6	78.4	85.5		74.5
Main facilities	Individual room	190	284	110	280	76
	Special room	5	8	5		
	Bath	Yes	Yes	Shared	Yes	Shared
	Toilet	Yes	Yes	Shared	Yes	Shared
	Telephone	Yes	Yes		Yes	
	Training room	14	25	7	30	5
	Lecture room	Yes				
	Lobby	Yes	Yes	Yes	Yes	Yes
	Dining room	Yes	Yes	Yes	Yes	Yes
	Tea room	Yes				
	Various (Audiovisual training facility	Yes	Yes	Yes	Yes	Yes
	Tennis court	Yes	Yes		Yes	Yes
	Ping pong room	Yes		Yes		
	Social room	Yes				
	Japanese-style room		1	1	1	
	Coffee corner		Yes		Yes	
	CAI room		Yes		Yes	
	Gymnasium		Yes			
	Social lounge		Yes		Yes	
	Library			Yes		Yes
	Conference room			Yes		
	Volleyball court					Yes
	Auditorium/gymnasium				Yes	

Note: Training course and trainees (excluding those continued from the previous year) are based on the record yet to be ascertained.

(Private Industry's Exportation of Technology and Technological Training Programs Primarily Targeted for Asia)

Analysis of the survey responses indicate that countries which are participating in the technical scholarship trainee programs for the most part are from Asia, viz., Asia NIE, ASEAN countries, and China. Also, a large number from North America, where companies in the Tokai Region are constructing overseas manufacturing sites at a rapid pace, is being accepted. The principal objectives are "to achieve a smooth operation of overseas production and technical transfers" and "to ensure and expand export markets for their products" (including "follow-up" exports) with more emphasis being placed on the latter. The reason for this is that, in many cases, the transfer of operations and the management of software component following exportation of hardware are being counted as technical exports.

The technologies consist mostly of "manufacturing and processing control technology (including maintenance)", "quality control technology," and "product development and application technology." In the area of technology exports, a relatively large number of respondents chose "design technology." Especially in the area of technical training, many selected "manufacturing and processing control technology" and "quality control technology" as important, from which we may infer that the technological guidance accompanying companies' construction of overseas plants is an underlying driving force. Furthermore, technological training programs are being implemented at overseas plant sites as well as in the Tokai Region. In terms of the types of industries involved, transportation and electric machineries constitute 70% of those accepting trainees.

The problem concerning technical transfer defined broadly, the factors of "inadequate protection of intellectual rights," "lack of information concerning companies and technologies," and "the lack of engineers and related technologies" have been pointed out with respect to Asia NIE's, ASEAN countries, and developing nations. Moreover, a substantial number of companies have expressed their concern with Asia NIE's regarding possible "post-transfer boomerang effects." In the case of ASEAN countries and other developing nations, companies noticeably tended to responded, "our production cells themselves are alien to them."

With respect to technological training programs, central to the matter of technical transfer in the Tokai Region, "securing trainees' accommodations and paying their living expenses" is pointed out as a big problem. Companies with less than one billion yen in capital have made a point of the program being "especially difficult for medium/small-size companies to accept trainees because of the way in which small/medium-sized companies are organized and function as a system." In addition, as internal problems related to technical scholarship training programs, many pointed out the "lack of people with adequate language skills" and the "preparation of trainees in acquiring Japanese language skills prior to entering the training program is woefully inadequate."

Furthermore, the enforcement of the revised Immigration Control and Refugee-recognition Act, effective June 1990, which recognizes third-generation overseas Japanese as a legitimate labor force, dramatically increased the number of foreign workers. The statistical figures on foreign residents indicates that, in the Tokai Region alone, there are 4,962 of those (end of 1990, non-manufacturing sector included). Of these, technical trainees number 1,572. Since the number of foreign workers has increased to more than three times the number of technical trainees, it is necessary to consider them as latent technical trainees.

(Various NGO Activities)

Amidst technical-transfer activities which are gathering steam, foreign trainees tend to find life in Japan difficult as they are coming into contact with an alien culture, manners, and customs. Fortunately, in the Tokai Region, thanks to the Non-Government Organization (NGO), trainees will find a wide variety of opportunities to meet people. The "IF Club" provides support as well as opportunities for the trainees at the JICA Nagoya International Training Center to meet Japanese people socially. Both the "Association of Sino-Japanese Human Resource Exchange" and the "Aichi Sino-Japanese Youth Training Association" also accept trainees into their programs, and the "ALOE Club" promotes exchange with trainees. These are all steadily developing their programs to assist foreign trainees in Japan. Moreover, the International Traffic Safety Society(foundation)'s ATSS Forum is giving a course built on the theme of Japan and its modernization process to a nucleus group of leaders from ASEAN countries, thus continuing its unique activities stressing the importance of a knowledge of cultural backgrounds in dealing with technology.

(Lack of Human Resources in ODA)

The concept of international technical cooperation subscribed to by many companies is represented by the cooperation which they provide to ODA and other public facilities. The survey results indicate that 65 companies have had the experience of cooperating with Asian countries (as was the case with the technical training programs). In addition, 18 companies indicated that they had accepted trainees with JICA and AOTS acting as intermediaries or requestors. From 10 to 12 companies cooperated with ODA-related surveys and developmental projects, sent their technical specialists abroad, and participated in Japan Overseas Cooperation Volunteers.

As problems arise from technical cooperation through ODA and similar organizations, respondents frequently attributed the following as causes of the problems: "lack of personnel within a company," "suffers in business profitability," "inadequate security measure by national and regional governments," and "the small number of projects on which the company can cooperate."

2. Present State of Technical Imports, Research Cooperation and Joint Research

(Industry's Importation of Technology Mostly From the United States and Europe)

The survey finds that companies in the Tokai Region import technologies mostly from North America and Europe in the fields of product development and application technology, indicating their strong motivation for importation of cutting-edge technologies and improvements in their product quality.

As problems related to the importation of technology, in connection with the current system, more than a few companies pointed out the "trend for technological protectionism." A large number of companies, moreover, perceived the "lack of information on content and standards of research" as the problem. The factors of "not enough researchers" and "insufficient government support" are pointed out as problems arising from within.

(Universities and National Research Institutes Major Players in Research Exchange)

Research exchange encompassing joint research and research cooperation is being handled by universities and national research institutes in various ways.

The survey finds that universities in the Tokai Region signed 161 (75 national and public and 86 private universities) academic exchange agreements with universities and research organizations abroad. For instance, Nagoya University signed 44 agreements, 15 with those in China and, to a lesser degree, with those in other parts of Asia; 12 with those in North America; six with those in Western and Northern Europe; and four with those in the former Soviet Union and Eastern Europe. In addition to agreements with institutions, Nagoya University also signed agreements with such research organizations as the New Zealand Ministry of Science and Industry's Physics and Engineering Research Institute, the Indonesian National Aerospace Research Institute, and the European Council for Nuclear Research.

As for joint research, Nagoya University now is working with Stanford University's Linear Accelerator Center, Germany's [Kern] University, and the European Council for Nuclear Research on the themes of electron-positron collision test, statistical research in generating stars, measurement of the functions of the neutron and proton spin-dependence structure, respectively. Toyota Industrial College is conducting research on a "thunder"-related theme jointly with the U.S. National Severe Storms Laboratory, Indonesia's [Bandon] Technical University, and the University of California, Berkeley. Suzuka Industrial College's joint research project on automobile-related new functional materials involves Ohio State University.

In the area of research cooperation, Nagoya University is cooperating with Latvia University in pursuing research in a quantization chemical model for an electronic-excitation-inducing atomic process.

Government research institutes and third-sector research organizations also are involved in joint research as well as in research and technical collaboration efforts.

The Agency of Industrial Science and Technology (AIST)'s Government Industrial Research Institute, Nagoya, is conducting research jointly with the countries under the umbrella of International Energy Agency on solar heating and cooling and with universities and government research institutes in the United States and Germany, on advanced engines. The Government Industrial Research Institute, Nagoya, also is conducting joint research with American universities and government research laboratories on acid rain, bioactive substances, and intelligent bioreactor systems. In the area of research collaboration, the institute also is collaborating with Turkey, Brazil, and Mexico dealing with the themes of resource use and metallic materials.

The Fine Ceramics Center (foundation) is participating in two joint research projects. One is a joint undertaking with the United States and European countries dealing with preparatory research in standardization of ceramics mechanical properties and the other, with the United States, Germany, and Sweden, concerning testing and evaluation methods regarding properties of structural ceramic powder and materials.

Although the public research agencies are primarily cooperating in the implementation of technical scholarship trainee programs, the Nagoya City Industrial Research Laboratory also is active in other fields as well, viz., sending its officials to ODA-related projects to serve as specialists and conducting joint research with Lehigh University in the United States on the development of polymer materials.

Section 3. Needs for International Technology Exchange

(International Technology Exchange From a Business Standpoint Will Be Technical Transfers)

Future trends in international technology transfers, according to the survey, may be summarized as follows (Table 6).

Technical training and importation of technology will become less important while joint research and research collaboration will gain ground to some extent. However, technical transfer, per se, including exportation of technology and technological training, will continue to play a major role in the international exchange of technology in the Tokai Region.

Our partners will be Asia, the United States and Europe in a broadly-defined area of technology transfer, which encompasses exportation of technology, technological training, and technical collaboration, as is the case today. Importation of technology and joint research, however, involve only the United States and Europe. However, insofar as technical training is concerned, reflecting the trend toward overseas business ventures, there will be a shift in identities of those in partnership, from NIEs (Korea and Taiwan) to ASEAN countries and China.

As for the objectives of technology exchange, at present, most respondents chose "securing and expanding export markets" and "smooth operation of overseas production" as their objectives. For the future, an increased number of respondents chose "the industrialization of partner countries and assistance in their development," "cooperating with public policy," and "industry's unique contribution to international endeavors," thus reflecting the rising awareness of the business community in the Tokai Region of its social responsibility and obligation to make international contributions.

As for the content of technology exchange, for the present, the majority selected "manufacturing and processing control technology" and "quality control technology" in the category of exportation and technology transfers, and "product development and applied technology" and "design technology" in the area of importation. However, for the future, reflecting the increasing seriousness of the global environmental problem and of the introduction of the market economy into China, the choice of many respondents was "environmental protection technology" and "management technology."

As for technological level, whereas the transfer of mature technology was central concern in the past, for the future, many companies are foreseeing the transfer of cutting-edge technologies. The technological gap between Japan and Southeast Asia used to be one of from two to three years; however, at present, in some fields, the gap has shrunk to as little as three months. Apparently, in responding to the questionnaire, Japanese firms must have considered not only Japan's efforts to industrialize its "partner nations" and to make international contributions but also the shortening of global technological cycles.

Table 6. Present State and Future Prospect of International Technology Exchange of Private Businesses

Response rank in exchange field	Technology transfer (2nd-1st rank: 150-100)			Technology transfer (1st-2nd rank: 150-100)			Technology transfer (4th-3rd rank: 68-58)		
Target countries and regions	Rank	Past performance	Future increase (%)	Rank	Past performance	Future increase (%)	Rank	Past performance	Future increase (%)
	No.1 No.2 No.3 No.4 No.5 No.6	Korea North America Taiwan ASEAN China Thailand	Korea North America Taiwan ASEAN China Thailand	No.1 No.2 No.3 No.4 No.5 No.6	Korea ASEAN North America China Taiwan Thailand	ASEAN China Thailand North America Korea Taiwan	No.1 No.2 No.3 No.4 No.5 No.6	Taiwan Korea North America ASEAN China England France Germany Italy	ASEAN North America Korea China England Germany France Italy Taiwan
Main objectives and future change	(1) Smooth overseas operations and tech. transfer (2) Ensure and expand export markets (3) Cooperate in industrialization and development of partner nation (4) Exportation of technology and training programs as business enterprise (5) Effective use, securing of foreign resources; for future, an increased number of people said, "cooperate with public policies"			(1) Smooth overseas operations, technology transfer (2) Ensure and expand export markets (3) Cooperate in industrialization and development of partner nation (4) International contribution unique to business (5) Training programs as business enterprise and cooperation with public policy; for the future, an increased number of respondents said "effective use and securing of foreign resources"			(1) Ensure and expand export markets (2) Smooth overseas operations and tech. transfer (3) Cooperate in industrialization and development of partner nation (4) Exportation of technology, training program as business enterprise (5) Cooperate with public policy; for the future, a noticeable increase in number of people who responded, "international contribution unique to business community"		
Technical content and future change	(1) Manufacturing and processing control technology (2) Quality control technology (3) Product development and application technology (4) Layout and design technology; for future, an increased number of respondents chose environmental protection technology and business management technology			(1) Manufacturing and processing control technology (2) Quality control technology (3) Design technology (4) Product development and application technology; for future, a noticeable increase in the number of people who chose environmental protection and business management technologies			(1) Manufacturing and processing control technology (2) Quality control technology (3) Product development and application tech. (4) Design technology; for the future, a noticeable increase in the number of who chose environmental protection and business management technologies		

[Continued]

[Continuation of Table 6]

Response rank in exchange field	Importation of technology (3rd-4th: 102-48)			Importation of technology (3rd-4th: 102-48)			Importation of technology (3rd-4th: 102-48)		
Target countries and regions	Rank	Past performance	Future increase	Rank	Past performance	Future increase	Rank	Past performance	Future increase
	No.1 No.2 No.3	England, Germany, France, Italy North America Other (include EC)	North America England, Germany, France, Italy Other (include EC)	No.1 No.2 No.3	North America England, Germany, France, Italy Other (include EC)	North America England, Germany, France, Italy China	No.1 No.2 No.3	North America Taiwan England Germany France Italy	North America England, Germany, France, Italy Other (include EC)
Main objectives and future changes	(1) Explore and discover new technological seeds (2) Efficient R&D (3) Open up and secure overseas markets (4) Effective use and securing of foreign resources; for the future, a noticeable increase in the number of respondents who chose "effective use and securing of foreign resources," "cooperate with public policy." and "international cooperation."			(1) Explore and discover new technological seeds (2) Greater efficiency in R&D (3) Open up and secure overseas markets (4) Effective use and securing of foreign resources; for the future, the trend continues but a noticeable increase in the number of respondents who chose "cooperate in industrialization of partner nations."			(1) Smooth overseas production setup and technology transfer (2) Secure and expand export market For the future, large increase noted in the number of respondents who said, "cooperate in the industrialization and development of partner nations.		
Technical content and future change	(1) Product development and application technology (2) Design technology (3) Manufacturing and processing technology (4) Basic science and technology For the future a noticeably increase in the number of respondents who chose science and technology and environmental protection technology			(1) Product development and application technology (2) Design technology (3) Manufacturing and processing technology (4) Basic science and technology For the future, an increased number of respondents chose science and technology and environmental protection technology			(1) Product development and application technology (2) Manufacturing and processing technology (3) Design technology For the future, an increased number of respondents chose quality control technology and basic science and technology.		

Note: Responses to "Past performance" and "Future increase" columns are based upon assumed figures for those of prior and of a subsequent few years. "Future increase" include, in addition to new undertakings, those of growth companies as indicated in the past performance column. When the total figure of past performance is shown to be less than that of "future increases" in exchange fields, this does not mean that there was a decrease in the level of exchange activity, itself.

(Some Diversity Displayed in the Need for International Technology Exchanges From the Standpoint of Companies)

International technology exchanges are expected to increase in importance as a company's management strategy and as a means of making international contributions. However, the survey reveals that, in the case of technology exchange, different viewpoints associated with different fields of activity are reflected in the order of their priority, viz., "company merits, situations involved, and policy," "promotion of industry and technology of the Tokai Region," and "Japan's international contribution."

First of all, in terms of "company merits, situations involved, and policy," importation of technology, when directly linked to product development, ranked first; however, many respondents also chose the exportation of technology and technical training. This indicates that companies are motivated, not only by technological developments but also by desire to make international contributions, thus demonstrating their awareness of the existing need for such contributions.

Secondly, in terms of "promotion of industry and technology in the Tokai Region," technological cooperation scored the highest, followed by the importation and exportation of technology. The reason why technological cooperation was ranked first is that they recognized the fact that it actually was foreign technology which supported industrial development of the region and that it is now their turn to provide technological assistance to the developing nations.

In terms of "Japan's international contributions," exportation of technology ranked first, followed by technological collaboration and joint research. This indicates that business sectors recognize the need for all-out efforts to resolve economic frictions with their trading partners and feel that they should make international contributions through the avenue of international technology exchange.

(Each County Has Different Needs)

A survey conducted among technological scholarship trainees concerning needs for technology transfer from overseas countries to Japan revealed the following (Table 7):

First of all, to the question, "In the industrialization of your country, which particular industry is considered the most important?", trainees from Korea and Singapore said that software is the most important, followed by precision equipment and electronic devices. The same order of importance was indicated in their response to the question, "Which industry is expecting to gain from technology transfer from Japan?" Since both countries have achieved rapid economic growth, their tendency to lean heavily on the electronics field is quite evident. Moreover, to the question, "From which Japanese technology do you expect to gain most?," they scored "quality control technology" and "product development and application technology" the highest. To the question concerning the most desirable "form of technology transfer," they

overwhelmingly chose "joint research," indicating their intention to import Japan's cutting-edge technology so that their industries may become high-level performance advanced technology industries.

The response of those from the ASEAN nations (excluding Singapore) indicated the industrialization of food, kiln and rock/earthen products, general machinery, and textile production as the most important. They also showed keen interest in transfer of "product development and application technologies" and "production and manufacturing technology" in the fields of general machinery and electronic equipment.

Chinese trainees regarded electronic equipment, food, and software technologies as important in industrialization of their country, and indicated that the items they expect from technology transfer from Japan are electronic equipment, precision apparatuses, and software, indicating their keen interest in electronic-related technologies. Moreover, it is worthwhile to note, as the technology which they expect most to gain from Japan, that they ranked "business management technology" first.

Response by trainees from Poland, Hungary, and Eastern European countries revealed the importance of electronic equipment, foods, and precision instruments in industrialization of their countries. As the technology from which they expect to gain most by way of technology transfer from Japan, they ranked automobile assembly first, which differs from other countries. As a technology which they hope to obtain through transfer, they ranked environmental protection technology first, reflecting the present state of Eastern Europe, suffering from serious environmental contamination brought about by destruction of forests by acid rain.

(Needs of Various Countries Fully Recognize the History of Japan's Own Development)

The foregoing may be summarized as follows: Importance of industry as a factor in a nation's industrialization differs from country to country, depending upon the developmental stages, industrial structure, and income levels of the country involved. When a country is in the import substitution stages, emphasis will be placed on industries related to the production of clothing, food, and housing, and improvement of infrastructure, involving food, textiles, cement, and metal products. Asia NIE's, the countries which are trying to catch up with Japan, are placing importance on export-type and cutting-edge technologies, such as electronics.

Moreover, those industries which expect technological transfer from Japan. although they may differ somewhat in degree depending on countries and regions in question, all place importance on technologies related to electronics, software, precision instruments, and automobiles. This points to the fact that they all recognize that Japan's own spectacular economic growth was achieved by developing electronics and computer technologies and by the sheer drive to realize their full potentials for achieving industrialization of the mechatronics technology.

Table 7. Ranking of Needs for Technology Transfer as Expressed by International Technological Training Agencies and Trainees in the Tokai Region

	Korea Singapore	ASEAN nations	China	Other developing nations	Eastern Europe Poland, Hungary
Most important industry in a given country's industrialization	1.Software 2.Precision instrument 3.Electronic equipment 4.Casting, die, etc. 5.Electronic components	1.Foods 2.Kiln and rock/earth 3.General machinery 4.Textile 4.Construction metals 4.Software	1.Electronic equipment 2.Foods 2.Software 4.Petroleum products 4.Basic metals 4.Precision instrument	1.Foodstuffs 2.Basic metals 2.Casting, die, etc. 4.Electric equipment 4.Electronic equipment 5.Electronic components	1.Equipment 2.Foodstuffs 3.Precision instrument 4.Other chemical products 4.General machinery 4.Electric equipment 4.Automobile assembly
Industry from which technology transfer is expected	1.Software 2.Precision instrument 3.Electronic equipment 4.Electronic components 5.Casting, die, etc.	1.General machinery 2.Electronic instrument 3.Foodstuffs 4.Textile 5.Kiln and rock/earth 5.Electric instrument	1.Electronic equipment 2.Precision instrument 3.Software 4.Electric equipment 5.Automobile assembly	1.Electronic equipment 2.Foodstuffs 3.Casting, die, etc. 4.Electric equipment 4.Electronic components 4.Automobile assembly 4.Software	1.Automobile assembly 2.Electronic equipment 3.Precision instrument 4.Plastic 5.Automobile parts
Technology expected for transfer from Japan	1.Quality control 2.Product development 3.Basic chemical technology 3.Design	1.Product development 2.Production/ manufacturing 3.Quality control 4.Environmental protection	1.Business management 2.Quality control 3.Production/ manufacturing 4.Environmental protection	1.Production/ manufacturing 1.Quality control 3.Production development 4.Design	1.Environmental protection 2.Production/ manufacturing 2.Quality control
Form of technology transfer expected from Japan	1.Joint research 2.Sending specialists 3.Research cooperation	1.Joint research 2.Joint venture 3.Sending specialists	1.Joint venture 2.100% direct investment	1.Joint venture 2.Supply facility 3.Joint research	1.Joint venture 2.License manufacturing 3.Research cooperation
Who should receive training in Japan	1.Private sector engineer 2.Private industry middle management 3.Private industry field worker	1.National government employees 2.Public corp. engineer 3.Private industry engineer	1.Public corp. engineer 2.Public corp. top management 3.National government employees 3.Local government employee	1.Private industry engineer 2.Public corp. middle management 3.National government employee	1.Local government employee 2.Public sector middle management 3.Private sector middle management

Although its accumulation of electronics technology is not quite what it should be, the Tokai Region, nevertheless, has succeeded in industrial structural conversion, presenting a miniature image of Japan's industrial history. This history itself is considered a valuable asset in carrying out technology exchange. This is the reason why the Tokai Region has a more than adequately equipped base from which to take on international technology exchange.

Section 4. International Technology Exchange: Problems Remaining To Be Solved

Companies in the Tokai Region are actively engaged in business on a global scale, in the so-called "four polar structure" formed by Japan, North America, the EC-Europe, and Asia (Asia NIE's, ASEAN countries, China, etc.). As mentioned previously, a broadly-defined technological transfer resulting from exports and entry into overseas markets now constitutes the main part of international technology exchange.

Much talk of economic frictions with various countries has brought an increasing number of the companies in the Tokai Region to realize that they must make unique contributions as a part of the business community and cooperate in implementation of ODA policy. There is an indication that a consensus among the Tokai companies that international technology exchange must be pursued within the context of the entire Tokai Region is beginning to form.

Moreover, the survey taken of the trainees in the Tokai Region indicates that they have high expectations for international technology exchange as a means of achieving their own countries' economic development and are hoping that the transfer of technology from Japan will be carried out smoothly.

Thus, the needs for promotion of international technology exchange in the Tokai Region continue to rise. In order to meet these needs, it will be necessary to overcome the various problems pointed out below.

(Inadequacy in Information Functions)

First of all, information related to international technology exchange is being gathered and made available by various central organizations' local agencies and by regional universities. Consequently, as pointed out in the surveys, data on partner nations' business and technology with reference to technology transfer and available information regarding research content and technical standards of partner nations with respect to technological importation are frequently inadequate. Since mainstay and medium/small businesses, which will form the nucleus of globalization in the Tokai Region, for the most part, have neither their own information network nor any means of access to essential information, enhancement of information functions remains an important problem to be resolved.

(Training Setups Still Incomplete)

Secondly, now that the revised Immigration Control and Refugee Recognition Act, which makes the provision of a training program by the private sector

possible, is enforced, it becomes necessary to study the content and the objectives of training programs designed for joint efforts of the public and private sectors.

Since a further increase in technological training programs is anticipated, it will be necessary to improve training methods, including post-training follow-up provisions, and the content of the program. Also, the setup for receiving trainees, including accommodations and living facilities and environment, need to be improved. Especially, in view of the fact that JICA's and AOTS's capacities for receiving trainees already have reached their limits, as has been pointed out, quick action will be required to expand and improve the trainee acceptance setup in this region.

Moreover, in order to implement training programs capable of meeting diverse needs of trainees with accuracy and translating these needs into action, cooperation and support from local agencies are essential. Close partnership and cooperation with related agencies, including support systems, and improved networking systems must be pursued further.

(Lack of Responsible Leaders in the Field of Technology Exchange)

Thirdly, in carrying out international technology exchange in the Tokai Region, development of responsible leaders is an extremely important problem which must be solved. Especially, when we have to deal with increasingly diversified partner nations, the importance of developing not only those who have English language skills but also possessing other language skills becomes extremely urgent. Moreover, a setup designed to conduct a human resources development program systematically also is an important area requiring action.

(Public Sector Activity Must Be Bolstered To Promote International Joint Research and Research Collaboration)

Fourthly, since international joint research and research collaboration undertaken by the private sector are subject to various restrictions, the role of the public sector, consisting of universities, national and local research institutes, etc., in the Tokai Region is a significant one. In order to promote international joint research and research collaboration still further, each agency must strengthen its own functions while working in partnership with others; moreover, while expanding their activities and functions, vigorous efforts must be made to entice new organizations to come to the region or to establish one of their.

(Each Dealing With International Technology Exchange in Its Own Way)

Fifth, in order to give shape to international technology exchange, it is necessary to link organically individual efforts and future efforts. Formation of a base equipped with an integrative coordinating function, designed to enhance the effect of each function working in synergy and complementing one another.

Chapter 3. Summary of the Concept of International Technology Exchange in the Tokai Region

Section 1. Need for the Concept of International Technology Exchange Base

In order to invigorate the industrial economy and to attain economic growth utilizing industrial technologies accumulated in the Tokai Region (while bearing in mind what has been said in the first chapter's Section 2 entitled, "How Japan is Dealing with International Developments in Scientific and Technological Activities"), it will be essential for the administrations of industry, business, universities, and research agencies to work in partnership as they form an international technology exchange base in the Tokai Region, serving as a springboard for regional, national, and international technology exchange activities and as a presence easily recognizable from outside of the region and Japan. The following paragraphs provide a detailed account of this concept.

As stated in the foregoing, the globalization of the Tokai Region's industry and economy has been proceeding as part of the four-polar structure involving Japan, North America, EC-Europe, and Asia (NIE's, the ASEAN countries, China, etc.), and their mutual dependency is expected to increase. Moreover, as the fields of exchange, it is expected that technology and research will gain considerably. The result of the company survey attests to this fact; it also is reflected in the trainee needs survey. Efforts should be made accordingly to approach the expansion of the technology and research field as a problem which needs to be solved and acted upon with precision. For this reason, it will be necessary for the Tokai Region to put in place a new foundation on which international technology exchange can be built.

Moreover, the region, considered a nucleus block of industrial technology, possesses thick layers of industrial technologies and is witnessing further improvement being made in the region's R&D functions. Indeed, the Tokai Region, which has potentials higher than most regions, must play an active part in making the kind of international contribution, which is what the world expects of Japan. In addition, by both by maintaining and improving the high-level technological standards characterizing the Tokai Region, it is important that the region engage in research and development, which provide the kinds of stimulus and new perspectives which only global exchange can bring. For this reason, formation of an international technology base to serve as a global strategic strong point necessary for continued growth of industry and technology in the Tokai Region is essential.

Moreover, from the standpoint of the Fourth National Development Plans, (which positioned the Tokai Region as "a region capable of achieving world-class R&D and international exchange functions in the field of high-tech industry and of serving as a center of industrial technology,") a project designed to revamp the region as an international technology base is essential. By putting in shape such a base with high international visibility," the region will gain worldwide recognition and the power to transmit information, something which thus far has been lacking.

Furthermore, this will generate new markets as products of regional companies gain worldwide recognition (the Tokai Brand).

Moreover, the formation of the international technology base will bring the region one step closer to becoming the site of the twenty-first EXPO and to the realization of the New Chubu International Airport construction project, as worldwide needs and expectations are demonstrated.

Thus, the formation of the international technology exchange base must proceed with individual organizations and companies working together in close partnership to achieve the goal of the whole region. The "Concept of the International Technology Exchange" shows the way in which this goal will be attained.

Section 2. Summary of the Concept of the International Technology Base

1. Basic Principle of the Concept of International Technology Exchange

The basic principle may be stated as follows: "The formation of an international technology exchange base, designed to pursue the creation, distribution, and transfer of science and technology utilizing the potential seeds existing in the Tokai Region."

In other words, its goal is to form a worldwide exchange base in the Tokai Region in order to develop the globalization of science and technology and to deal with domestic and foreign technological needs and problems requiring solutions, while playing a leading role in Japan's efforts to make its international contribution, thereby revitalizing regional industry and economy.

2. Grand Design for the Concept of International Technology Exchange Base

International technology exchange in the Tokai Region, based on the results of the surveys containing both past performance and present state, can be graphically presented graphically (Table 8) showing joint research and research collaboration as a dominant means of technological exchange with advanced industrialized nations in North America and EC-Europe, and technological training, technical collaboration, and exportation of technologies as a dominant means of exchange with other countries, chiefly those in Asia.

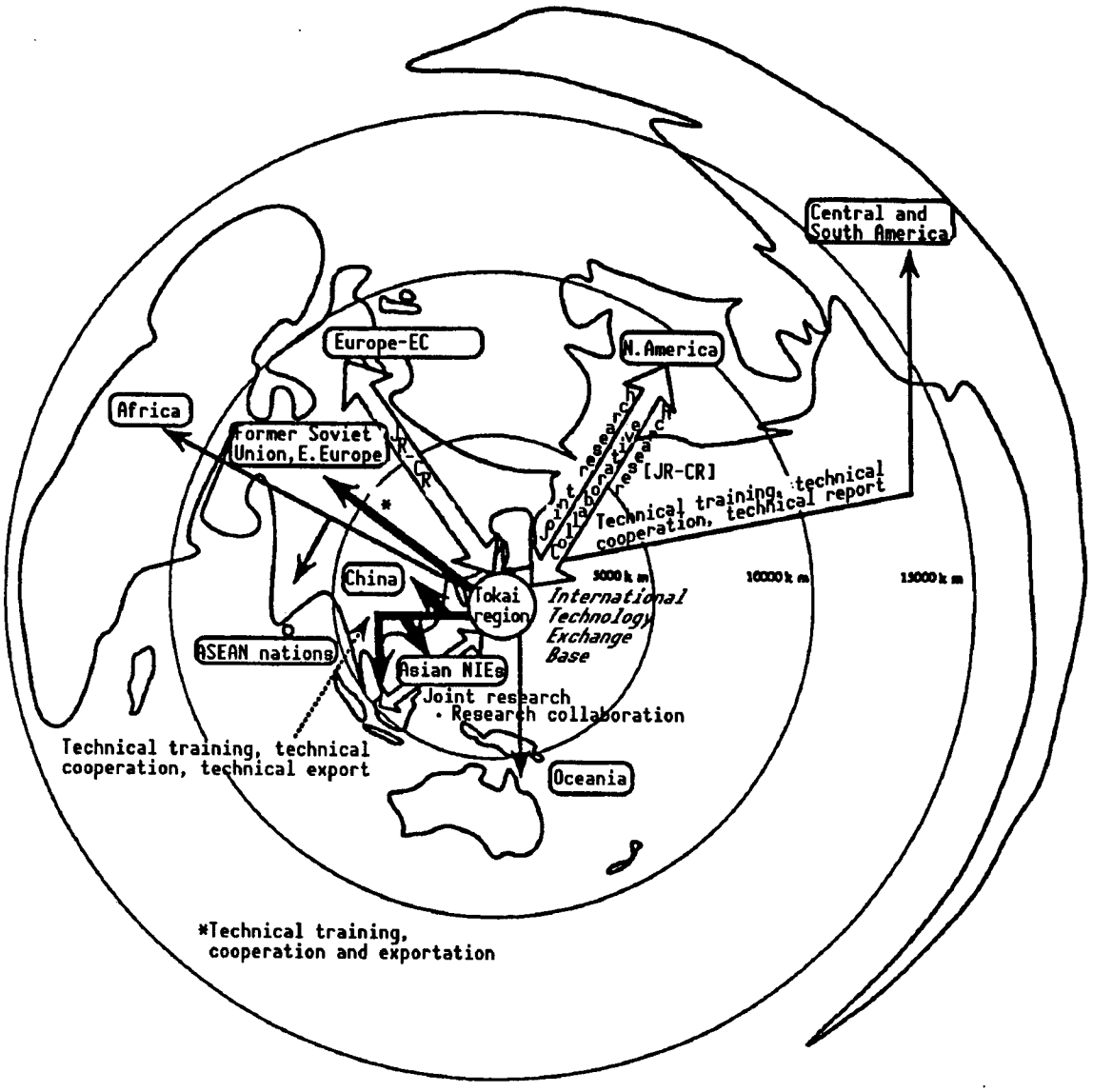


Figure 8. Graphic Representation of a Short-Range International Technological Exchange Centering Around the Tokai Region

Based on the image presented in Table [Figure] 8, the grand design for the concept of international technology exchange base deals with the needs (Chapter 2, Section 3) of the Tokai Region and acts upon its problems with precision. Moreover, its place as a base in a worldwide scheme can be represented graphically as shown in Table 9.

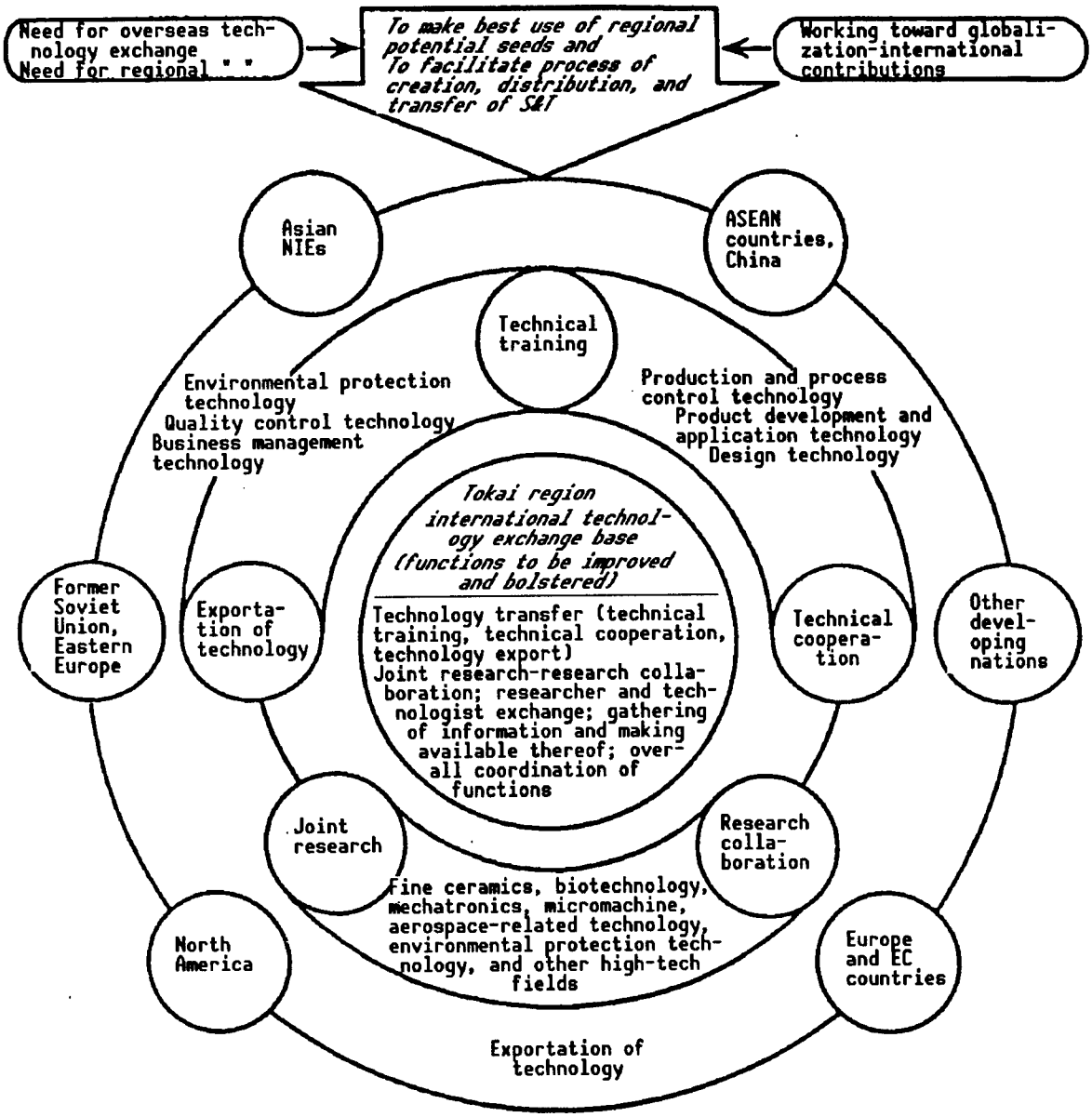


Table 9. Grand Design for the Concept of the Tokai Region International Technology Exchange Base

(1) Technology Exchange Target Regions

Efforts to advance globalization of scientific and technological activities must be directed toward all parts of the world. However, it is best to proceed with the so-called technology transfers, which include technical training and cooperation, and exportation of technology, with Asia NIE's, the ASEAN countries, China, the former Soviet Union, and Eastern Europe as its principal targets.

(2) Fields and Content of Technological Exchange

By making the most of the particular characteristics of the Tokai Region and by considering utilization of seeds of the potentials and the needs of countries abroad, the exchange of technology will proceed with emphasis on the following areas:

- Technical training—Technical cooperation—Exportation of technology:

  Production and process control technology, product development and application technology, quality control technology, business management technology, environmental technology, and design technology.

- Joint Research—Research collaboration:

  Fine ceramics, biotechnology, mechatronics, micro-machine, aerospace-related technology, and environmental protection technology, and other cutting-edge technologies

(3) Functions Which Must Be Reorganized and Strengthened

In order to facilitate technology exchange, an international technology exchange base must have the following functions restructured and strengthened:

1) "Technology transfers (technical training, technical cooperation, and exportation of technology)" aimed at international contributions through technology;

2) "Joint research and research collaboration functions," a backbone of international technology exchange, which will lead to improved regional R&D capabilities;

3) "Functions for gathering and making available technical information," "researchers and technological exchange functions," and "development of leaders in the field of international exchange," all of which are basic conditions of international technology exchange; and

4) "Overall coordinating function" which provides overall coordination of the international technology exchange-related projects and various other types of activities while contributing to the smoothing of operation and effective operational activities.

(4) Time-Table for Achieving the Foregoing

Bearing in mind certain regional needs, early action will be taken to reorganize and strengthen the three functions. Of the "technological transfer function," the "technological training function" part will be the first to be strengthened. Also the "joint research and research cooperation functions" and the "overall coordinating function" also will be reorganized and strengthened. The year 2000 is the date set for revamping of the functions of the entire concept.

Chapter 4. Nucleus Projects for the Concept of an International Technology Exchange Base

After having selected appropriate strategies for rearranging and improving functions designed to promote international technology exchange, we then decide on the nucleus projects essential to realize the concept at an early stage. Accordingly, the following three will be selected, this selection based on the relative urgency of projects as well as on their respective domestic and overseas appeal. Their specific contents, on close examination, may be summarized as follows:

1. Restructuring and Improving Technological Training Functions

Early action is essential in the strengthening of the "technological training function" in the Tokai Region because of the greater need for technological training here and abroad created by an increasing number of Japanese companies entering the overseas markets, combined with the fact that present state of existing public agencies is in bad repair. Although public agencies should deal with the problem, since strengthening of the technical training functions generate strong secondary effects which cannot be ignored, the active support and cooperation of private sector will be essential. The expansion and bolstering of "technological training functions," therefore, must be carried out by joint efforts of the public and private sectors.

Among the concrete projects aimed at expansion and reorganization of the Tokai Region's "technological training function" based on the above considerations are those dealing with expansion and revamping of the JICA Nagoya International Training Center and the AOTS Chubu Training Center, specifically those aimed at strengthening ICETT's activities, those pursuing the concept of the Toyota International Village, and making structural adjustments of the training setup of chambers of commerce and of commerce and industry associations. These projects must be pursued by promoting cooperation and the sharing of the loads among those involved (Table 10).

Of these, the JICA Nagoya International Training Center and the AOTS Chubu Training Center, affiliated with the national agencies, will require immediate attention because they need more space and their aging facilities need to be upgraded in order to accommodate expanding training programs.

Moreover, in order for the region to be able to accept trainees and conduct highly efficient training programs, the following points must be considered:

1) In order to provide Japanese language courses to trainees, we must work with language education-related organizations so that they can be conducted efficiently. Moreover, it will be necessary to train Japanese instructors on the receiving side also. As a means of achieving this, setting up a place where exchanges between trainees and Japanese instructors can take place will prove highly useful.

Table 10. Summary of Projects on Augmentation of Training Setup

Division	Summary of related projects
Expansion and reorganization of training facilities	JICA Nagoya International Training Center—Expansion and Structural Adjustment * Established as a base for the training and lodging of trainees coming from the developing nations to the Tokai Area. The center can accommodate 100. * Training courses offered here focus on the accumulation of industrial know-how existing in the Tokai Region, in the kiln, textile, and fine ceramics industries. * The records up to March 1991 indicate that the number of courses and the trainees accepted in the fields of machinery, metal, kiln, medium/small business promotion, and others, totaled 37 courses and 3,588 students. The trainees came from 79 countries, including nations in Asia, Near East, Africa, Central and South America, and Oceania. * The training center, constructed in March 1971, not only inadequate in space but also is badly in need of repair. Since it is not possible to expand the center simply by using a lot situated in the surrounding area, its expansion and improvement are being studied on the assumption that it will have to be moved to a new site.
	Expansion and Reorganization of AOTS Chubu Training Center * The private-sector-based technological cooperation agency, AOTS, has training centers established in Tokyo, Yokohama, Osaka, and Nagoya (Nagahisate-machi). * As a result of rising demands for international industrial technology transfer, the total number of applicants for the related technological training programs reached 5,000; but, because of ODA's budgetary framework, only 3,370 were actually accepted. * Because of its cramped quarters, the number of trainees which the Chubu Training Center can accept is far less than those accommodated in other centers, viz., 78 against 200 in Tokyo, 300 in Yokohama, and 122 in Kansai. (At present, the center is under reconstruction. When completed (target date : 1994), it will be able to accommodate 400 trainees. * For this reason, the annual rate of operation sometimes reaches nearly 80%; moreover, since the building was constructed in October 1970, it is cramped and is badly in need of upkeep. An increasing number of people are now demanding that the center be moved to a new location so that facilities can be expanded.

[continued]

[Continuation of Table 10]

Augmentation of setup for receiving trainees, others	Strengthening ICETT Activity * Aiming to make a contribution to the development of global environmental protection and the world economy through our efforts to achieve smooth technological transfers which will accommodate the unique characteristics of each country involved, ICETT was established as a nucleus facility of Suzuka Foothills Research University City in December 1990 in Yokkaichi. * Training, teaching, and R&D of industrial technology, utilizing the world's top level Japanese environmental management technology currently are being implemented. * In order to strengthen the center's activities further, new facilities are under construction with a target date for completion set for October 1992.
	Advancement of the Concept of Toyota International Village * A concept developed by Toyota City, known worldwide as an automobile town, which aims at construction of an information transmission/receiving base serving technology exchange and transfer and R&D projects related to industry and technology. * The village will be divided into 3 zones, viz., exchange, training, and research. In the training zone, in addition to the training and technology transfer related to the industrial technology and business management systems which make the most of "manufacturing technology." The idea of maintaining a place where various training needs can be met currently is under study.
	Augmentation of the Training Setups of Chambers of Commerce and Commercial and Industrial Associations * In 1991, a national policy of medium-small business, "A Model Project for Jointly Accepting Foreign Trainees," was established; and, with chambers of commerce playing a central role, projects involving guidance to agencies jointly accepting foreign trainees and a conference on their guidance in jointly accepting foreign trainees are being implemented. * In 1991, in the Tokai Region, Gifu Chamber of Commerce was involved in the implementation, receiving 45 trainees from China's Kiangsi Province. They were assigned to practical tasks.

2) As part of the efforts to construct efficient systems, the development of training methods and compilation of training glossaries will be required. Lack of formalized guidance has resulted in training instructors at some centers "grouping in the dark." Preparation of a manual, incorporating opinions of those experienced in training and of companies accepting trainees, together with development of expert systems, are considered necessary undertakings.

3) In accepting trainees, when implementing a system for evaluation, it is important to verify training results by obtaining relevant information from the training side as well as from the trainees and from this region as well as from the various overseas countries involved.

4) It is important to make certain that the program provides not only the opportunity to acquire individual technological skills but also those of business management so that trainees will be able to learn about technologies in proper context. Also important is to make trainees fully understand relationship between industry/technology and a national culture.

5) Depending on the more specific content of technological training, it is considered that it will be more effective to send experts and engineers to actual overseas sites so that they can provide on-the-spot training. This is being implemented by JICA. In such eventualities, it is important to have the active participation of as many native experts and engineers as possible.

6) It is important to set up measures for reorganizing a system so that companies in the region will be able to accept trainees, to develop those with leadership potentials, and to receive trainees in a warm and homey environment.

2. Making Structural Adjustment in Joint Research and Research Collaboration Promotion Functions

In expanding and rearranging the Tokai Region's "joint research and research collaboration functions," aimed at development of industries which are directly vitalizing the region, it will be necessary to pursue energetically both international joint research and research collaboration while providing the necessary stimulus for vigorous R&D activity in the region.

For this reason, it is important to take on cutting-edge R&D by marshalling collective resources of the region's industry, academic circles, and government. In order to achieve this, it will be important to expand and reorganize these advanced R&D capabilities which encompass international technology exchange activity functions (inclusive of the facilities for receiving overseas researchers).

Among concrete projects being considered are the expansion and reorganization of AIST's Government Industrial Research Institute, Nagoya, which plays a central role in high-tech R&D and international research exchange; realization of the concept of a science and technology exchange center (whose objective is to help with germination of joint research projects leading to next generation technology) as nucleus facilities in the Aichi Scientific Research and

Table-11. Projects Related to Augmentation of Bases for Accelerating Joint Research and Research Collaboration

Division	Summary of related projects
Projects related to augmentation of a foundation to accelerate advanced R&D (Basic research and high-tech field)	Expansion and Reorganization of AIST's National Industrial Technology Research Institute, Nagoya * In order to respond to the high tech R&D challenge of the 21st century, as a nucleus center for material R&D revolving around Japan's basic research, the institute is reinforcing R&D functions and studying the best methods of augmenting the existing organization and foundation as well as research support systems while bearing in mind the option of moving to a new site. (This is under study by a newly installed Chubu Industrial Technology Round-Table Discussion.)
	Concept of Augmentation of a Research Support Center * The concept of augmenting research support system (to assist in reinforcement of R&D functions and to augment research support systems which make the most of R&D potentials and to promote the synergistic effect) is under study by the National Industrial Technology Research Institute, acting as the nation's nucleus research agency.
Project related to augmentation of joint research and research exchange bases	To Promote the Concept of Scientific and Technology Exchange Center * Aichi Prefecture currently is studying the augmentation of the science and technology exchange center as its significant effort to make the region a capital, as it were, of industrial technologies open to the world, mainly focusing on the way in which industry, academic circles, and government conduct studies. Its objective is to construct a base for research exchange activity involving researchers, including foreigners, both in and outside this area. * Main Undertakings: Research exchange promotional undertakings (various research forums, membership-based exchange associations, sponsorship of or invitations to conferences, seminars, etc.) Educational training undertakings (university joint seminars, adult reeducation seminars, etc.) Information service (including search for joint themes and the planning of and serving as an intermediary in joint research) Partnership of technology-related groups

[continued]

[Continuation of Table 11]

Project related to augmentation of other R&D promotional base	Super-High-Temperature Research Center—Gifu Center Super-High Temperature Material Research Institute—Gifu Research Laboratory * To augment facilities designed for research and evaluation of the properties, functions, and reliability of materials in super-high-temperature environments as part of the research foundation augmentation project. Date of completion: June 1991. * In April 1992, full-fledged operation of evaluating possible practical characteristics of various materials began. * Working toward further improvement and autonomous research, of research exchanges, and bolstering and expansion of the information service project.
	Fine Ceramics Center * Established in May 1985 as a national center designed to solve problems and to advance its goals through the effective use of fine ceramics, a new material which now supports high tech industries. (Began its operations in April 1987). * As the only agency which "tests, inspects, and evaluates" fine ceramics, the center is aiming for the improvement and expansion of R&D projects, international exchange projects, and education/information dissemination projects.
	Scientific Research Institute for Nuclear Fusion * Following the relocation of the Nagoya University Plasma Research Institute in Toki City, through integration with other university research divisions, the national research institute, equipped with the world's largest helical-type of nuclear fusion equipment, was established in May 1989. * Augmentation of the facilities is progressing as scheduled, and completion is expected at sometime in 1997.
	Japan Microgravity Research Institute * Facilities, designed for the kinds of simple microgravity and supervacuum experimental research which can be conducted repeatedly on the ground (microgravity drop experimental facilities), were established in April 1990, using the Power Reactor and Nuclear Fuel Development Corporation's mining shaft in Toki City. * Currently, structural adjustment is continuing in order to have the facilities ready for operation in 1993.

Development Zone; and further augmentation of the Gifu Center the Super-High-Temperature Materials Research Center (a foundation), the Gifu Research Institute, the Fine Ceramics Center, the Research Institute of Nuclear Fusion Science, and the Japan Microgravity Research Institute, all of which are conducting advanced R&D which are linked to international technology exchange, such as joint research and research cooperation. (Table-11)

Of these projects under reference, the expansion and reorganization project of the Government Industrial Research Institute, Nagoya, further enhances the institute's role as a major player in basic research as its level of research is comparable with those associated with academic institutions. Moreover, since its priority is to conduct R&D utilizing regional resources, local demand for the project is strong. It will be necessary, therefore, to have early implementation of the expansion/reorganization project. In such an eventuality, it will be especially important, at the same time, to work on the reorganization of the Research Support Center, which is equipped with the essential evaluation and analytical devices, a research laboratory accessible to outsiders, and facilities for receiving trainees—all of which are necessary if the institute is going to work in partnership with the industrial, academic, and public sectors.

Moreover, in order for the region both to implement international joint research and to collaborate in research, giving consideration to the following eight points especially will be important:

1) Although research projects will deal primarily with cutting-edge fields of with advanced industrial countries, private sector participation also is important. It will be necessary, also, to conduct research, designed to meet private industry's needs and at the same time is linked to the creation of science and technology, within a context of an "international framework."

2) As for joint research themes, a public subscription method, designed to appeal to the world in general, while, at the same time, to attract the kind of gifted researchers essential to success in joint research, will prove effective.

3) In order to induce researchers to remain with projects, it will be necessary to improve their living standards normally associated with those of advanced society, including acceptable housing facilities for researchers, and in general to establish a setup enabling the region to welcome overseas researchers as if they are part of our own families.

4) In its implementation, while working on the sharing of research loads and in forming a partnership among industrial, academic, and public sectors both here and abroad, since research activities are dependent on the use of brilliant minds of individual researchers, it well may be useful to consider forming consortiums dealing with certain themes with interested researchers from the three sectors participating.

5) The degree of success both in joint research and in research exchange are greatly dependent on whether a given project will be able to acquire a well-known researcher as a key person.

6) It also is important that universities utilize research students from developing countries. Having good research assistants is essential to the success of joint research and research collaboration endeavors. It not only will help students to earn a living but will also foster their research mentality and provide opportunities for them to learn management of research organizations and systems, which, on a long-term basis, will contribute to improvement in developing nations' R&D setup.

7) Although the augmentations of both the facilities and the functions mentioned above are focused on international-theme projects, it will be important to ensure that required facilities and equipment can be shared by general companies as well.

8) It is important that both joint and collaborative research are conducted within a set framework, taken from the standpoint of globalization of the scientific and technological activity already existing in the Tokai Region. Establishment of such a framework will require overall coordinating functions which must be properly maintained.

3. Augmentation of Overall Coordinating Functions

In the Tokai Region, internationally acceptable research organizations are currently being strengthened and various projects aimed at international technology exchange are under study. However, as has been pointed out in Chapter 2, an agency which can make changes in these projects so as to give true form to international technology exchange does not exist in the region. Since the economic segment of the region has expressed a strong desire to have such capability, it will be necessary then to develop a coordinating function which can integrate the various agencies' activities.

More specifically, this will be a function which "creates new systems to further international technology exchange." It will provide the framework and the directions for international technology exchange, a method of meeting the various problems related to technology exchange, and making overall adjustments required in international technology exchange—these functions must be augmented, together with software functions, in terms of international technology exchange base and functions providing support to researchers/engineer exchange and furnishing technological information services (gathering information and making it available).

By establishing new agencies or by expanding already existing one, we should be able to deal with these augmentations of functions. In this region, agencies which already are implementing projects on the promotion and dissemination of technologies, on technological training, and on technological assistance, based on technical exchanges among industrial, academic, and public sectors, are the Chubu Science and Technology Center, the Nagoya Industrial Science Research Institute (foundation), and the Tokai Industrial Technology Promotion Foundation. Use of these existing organizations is useful from the standpoint of having the international technology exchange base ready at an early date.

Of these agencies mentioned, the Nagoya Industrial Science Research Institute is limited to the project dealing with industry-related scientific research and human resources, and the training of able researchers; and the Tokai Industrial Technology Promotion Foundation, primarily to the promotion of industry-related research. The Chubu Science and Technology Center's activities, dealing with various projects related to science and technology in an integrated framework, however, will cover a broad area. When its system has been completely upgraded, it would be best to use this center as the overall coordinating agency to support international technology exchange. (Fig. (Table) 12)

Table 12. Summary of Projects Related to Augmentation of Overall Coordinating Functions.

Division	Summary of Related Projects
Project related to augmentation of overall coordinating functions in support of international technology exchange	Expansion and Reorganization of Already Existing Technological Foundation (Strengthening of Chubu Science and Technology Center) * Development and dissemination activities in technological promotion based on exchanges among industrial, academic, and public sectors centering around the Chubu Region being implemented. * Presently under study are innovative approaches to reorganization and expansion of systems existing in the Chubu Region, involving industrial, academic, and public sectors' exchange functions; technical research development functions; and information exchange functions designed to propel the policy of promoting technology and to coordinate various undertakings designed for technological promotion.

Chapter 5. Policy for Realization of the Concept of International Technology Exchange Base

The Tokai Region forms a nucleus bloc in the field of industrial technology. It possesses a broad range of industrial technologies, encompassing both traditional and modern industries, such as makers of porcelain, machinery, machine tools, and conveyors. Various types of manufacturing plants and private sector research institutions are to be found in the region. Moreover, when we consider the existence of excellent national, public, and private universities; government research institutes; and the concept of the research university city, clearly this region can be favorably compared with the Kansai and Kanto Regions in terms of its potentials as a base for international technology exchange.

Moreover, as described in Chapter 2, regional firms' awareness level regarding international exchange is high, and the expectation levels of overseas

students trained in this region, insofar as the region's role in international technology exchange is concerned, also, are quite high.

High potentials, keen business minds, and the expectations of overseas countries provide rich soils on which to grow the flowering plant known as the "international technology exchange base."

However, as analysis of the present state of organization described in Chapter 2 indicates, international technology exchange in the Tokai Region, when considered in proportion to its domestic share of economic activities, is markedly low. For instance, overseas researchers and engineers constitute approximately one fourth, JICA trainees one third, and the number of foreign capital companies no more than one-tenth of domestic share of economic activity, hence lagging far behind.

Consequently, we must raise the level of international technology interchange among various private sector companies, research institutes, and universities. However, this alone will not suffice. The Tokai Region, as a whole, must form an international technology exchange base which will serve as a nucleus in terms of basic and overall standpoints.

Specifically, as has been set forth in Chapters 2-4 through analysis of the present state and examination of the concept of the exchange base and nucleus projects, what must be done now is to drive the nucleus projects forward in order to create functions for technological transmission, receipt, and exchange covering the total Tokai Region from the world-wide vantage point, without, at the same time, conflicting with the concept surrounding the various regional self-governing bodies.

First of all, the JICA Nagoya International Training Center and AOTS Chubu Training Center should be expanded and reorganized in order to improve their training setups.

Secondly, in order to construct the promotional base for joint research and research cooperation, it will be necessary to ensure the following:
1) bolstering of the Government Industrial Research Institute's R&D functions, 2) expansion and reorganization of international technology exchange activity, and 3) creation of facilities for receiving overseas researchers at the "Research Support Center," which ideally should be constructed adjacent to the Nagoya Government Industrial Research Institute in order best to support its future R&D activities.

Thirdly, in order to adjust the projects related to international technology as may be required for formation of the exchange base, the base's harmonious development, integrated approach toward acceptance of cutting-edge researchers from advanced industrialized countries, and adjustment in exchange activity will be required. In other words, this is a project which will provide the overall coordination aimed at improving the technology exchange potential of each company and research institute, and advance the concept of research university city serving as both university and city through the exchange of researchers involving the entire region. For advancement of this project, the capabilities of the Chubu Science and Technology Center should be put to use.

In this chapter, the following specific measures for achieving the above have been examined:

In order for the exchange base to function effectively, the creation of a "visible to the world" exchange base is important. The essential ingredients are the harmonious development of concrete projects and the drawing together of related facilities in placing them. It is vital that these factors be kept in mind at all times.

Moreover, as described in Chapter 2, the movement toward realization of the concept of the three research university cities is progressing. This movement truly will be an essential part in forming the "visible to the world" base, to be achieved using an integrated approach adopted by the three research university cities, working together in partnership and sharing their unique functions. It, doubtless, will serve as the backbone of the international technology exchange.

Moreover, although this study has been focused on the Tokai Region, exclusively, we are aware that the Hokuriku Region needs a similar kind of international technology exchange base, centering around the Japan Sea. If the base is to serve the entire Chubu Region, further development involving both the Tokai and Hokuriku international technology exchange bases working in partnership can be expected.

1. Expansion and Reorganization of JICA Nagoya International Training Center and AOTS Chubu Training Center

There is an urgent need for immediate expansion and structural adjustments of both centers' facilities. This is something which must be dealt with immediately. For this reason, forming a regional consensus on the roles of the centers in the international technology exchange base, and methods of

allocating resources and supporting regional training functions must be studied.

As for the method of organizing this study, in view of the fact that the present training center was constructed with the support of local financial institutions and self-governing local communities, cooperation of the entire industrial, academic, and public sectors will be necessary. It will be especially desirable to have the regional financial groups, which are aware of the needs of local firms, willingly give their efforts to deal with this problem.

As a concrete organization, a "Conference on Advancement of International Technological Training in the Tokai Region" (temporary designation) will be installed and the following items will be examined and discussed:

1) Positioning of both training centers in the Tokai Region;
2) Concrete plans for their expansion, specifying the scales and contents of both training centers' facilities;
3) New locations for both research centers; and
4) The prescribed role of support systems involving economic circles and related-self-governing local communities, etc.

With respect to their scale, it is reasonable to set the capacity of JICA to 200 trainees and that of AOTS to around 150, thereby doubling the number of trainees who can be accommodated. This proposal is based on the actual conditions of training centers in other regions and the particular needs of this region. As for the contents of the facilities, although not directly related to training programs per se, nevertheless, it will be necessary to make life at the training centers more pleasant by offering facilities which provide opportunities for trainees to interact socially, such as sports facilities and salons. As for the training programs themselves, it will be desirable to incorporate into the training programs total-company-management courses so that individual technological training will not end up simply being a fragmentary collection of knowledge and skills.

Furthermore, the installation of the "Conference on Advancement of International Technological Training in the Tokai Region" (a temporary designation) should be implemented immediately by securing agreement of the participants. It will be easier to obtain the understanding and support of the various companies involved while this matter still is under study. Moreover, the earliest possible study of the expansion plan and structural adjustments of the AOTS Nagoya Training Center is recommended in view of the center's pressing need for larger and better facilities.

2. Ensuring Adequate Facilities for Incoming Overseas Researchers at a "Research Support" Center Which Hopefully Will Be Constructed Adjacent to the Government Industrial Research Institute, Nagoya, To Promote Its R&D Functions, To Expand and Structurally Readjust Its International Technological Exchange Activity Functions, and To Support Its Future R&D Activities

At present, the "Chubu Industrial Technology Forum," to be installed by the Government Industrial Institute, Nagoya, will be studying the future prospect of strengthening the institute's function. As the Chubu Region's only government institute concerned with industrial technology, it is an important agency which plays a central role in international joint research involving various parts of the world. For this reason, it is essential to enhance its international technology exchange activity function.

In the meantime, in Nagoya City, there is a movement to invite the Government Industrial Research Institute, Nagoya, to relocate to the Shidanmi District and to occupy one corner of the "Aichi Scientific Research Development Zone."

Since the Government Industrial Research Institute, Nagoya, will be actively involved in research activity as a nucleus unit of the Chubu Region's (including the Tokai Region) industrial-academic-public sectors' joint research, many expressed the desire for the installation a "research support center." Some of its important functions might be to conduct regional joint research utilizing the institute's research resource and to receive overseas researchers with the capability of dealing with international joint research projects.

For this reason, it is appropriate to establish a "committee on the study of establishing a research support center" (a temporary designation) to decide on basic plans, while, at the same time, considering new facilities to receive overseas researchers. The plan for receiving overseas researchers of superior capability also should include the ways in which they will be made welcome and to feel at home.

Moreover, the installation and operation of this study committee are to be carried out primarily by the Chubu Region's administrative agencies, financial groups, and government research agency.

3. Fine Tuning of Overall Coordinating Function--Expansion and Reorganization of Chubu Science and Technology Center

In order to make the Tokai Region an international technology exchange base comparable to those of other regions in terms of excellence, it is important to create an overall coordinating function, designed to achieve organic partnership and to improve those regional functions required of a highly effective technology exchange base, without, at the same time, neglecting individual

functions related to international technology exchange. In order to fine tune the coordinating function, it will be necessary to take an integrated approach in effecting adjustments in an orderly manner by securing full understanding and cooperation from prefectures, cities, universities, and industries in the region.

The Chubu Science and Technology Center is a foundation whose aim it is to carry out various undertakings related to promotion of science and technology in a broad area, with the support of the industrial, academic, and public sectors from the entire Chubu Region, inclusive of the Tokai Region. Although the center, thus far, has not been involved in international technology exchange activity, as has been pointed out in Chapter 4, still it is considered the best organization to undertake the overall coordinating function.

For this reason, by improving the foundation's system of organization, securing quality personnel best suited for the job at hand, and by strengthening the financial base, we should work toward realization of this overall coordinating function.

(Improvement in Organization)

Although, needless to say, improvement in a secretariat itself is necessary, the Chubu Science and Technology Center also must fine tune its system for handling overall coordinating functions and secure necessary personnel of appropriate ability. In order to perfect the center's organization, first of all, it probably is best to establish an "International Technology Exchange Committee (temporary designation)," together with a secretariat setup which is to support this committee.

(Positioning of the Committee Within the Chubu Science and Technology Center)

The committee will be established within the foundation, and its operation and implementation of the committee's findings will be carried out by the foundation's secretariat. The committee will study and deliberate on matters which will be found useful in formation of the international technology exchange base of the Chubu Region, inclusive of the Tokai Region.

The content of the items for study and deliberation will be as follows:

(Content of Study and Deliberation)

• Creating a Frame and Direction of International Technology Exchange

The framework and direction will be created based on the full understanding of overseas researchers' wishes and the potentials of the region. These are essential if we are to double the volume of international technology exchange activities of gifted Japanese and overseas researchers at least in the immediate future.

More specifically, the committee will work toward their attainment in cooperation with related organizations within the region by formulating the basic plan for the international technology exchange and by widely publicizing its contents and appealing for cooperation both here and abroad.

• Implementation of International Technology Exchange Activity in the Entire Region

In partnership with related projects currently involved in international technology exchange activities, the region will receive researchers of superior capability, or send highly-gifted researchers working in the region to advanced industrialized nations. Moreover, as an international technology exchange base, the region will implement coordinating activities directly leading to formation of an exchange base "visible to all the world" by involving itself in the exchange of Japanese and foreign researchers.

(Securing Financial Resource)

The financial base will be increased to take care of the work generated by the overall coordinating function. However, when one considers the small size of the foundation's present endowment and the scale of its capital, combined with the fact that, unlike other regions, the scale of international technology exchange activities of Japanese and foreign researchers would expand almost as one looks on, it is reasonable that the endowment be enlarged more than several times, at least, preferably, as much as around ten times, if possible.

It is desirable to employ an explorative and flexible approach in establishing possible financial resources in order to sustain business activities, compiling a list of revenue sources from the following: yields from endowments; incomes generated by the implementation of coordinating functions for international technology exchange activities, viz., registration fees for symposiums, seminars, research forums, etc., in which both Japanese and overseas researchers are to participate; aid from various regional self-governing bodies; and contributions from business firms.

The foregoing covers expansion and reorganization of the present Chubu Science and Technology Center for use as an overall coordinating agency. For the future, it will be desirable for the foundation, acting on its own initiatives, to invite researchers from abroad to this region, send technical missions abroad, or to improve its own base for exchange activities, with the idea of establishing an "international technology exchange center" within the foundation. The following activities may be suggested as fundamental functions of the proposed center: 1) gathering and making available relevant information; 2) Aiding various types of related undertakings; 3) preparing a research cooperation manual; 4) Fostering education and disseminating knowledge; 5) establishing facilities for receiving researchers from abroad; and 6) a conference room equipped with simultaneous interpreting capabilities.

References

1) (Gathering and making available related information)
From the standpoint of serving as "a window for the Tokai Region" in international technology exchange, the proposed center will collect, organize, and distribute the following types of information: technical information; data on overseas companies; laws, regulations, and

protective measures concerning technological exchange; regional socioeconomic information; and information on related organizations located within he Tokai Region. Moreover, the gathered information will provide the basis for an information network linking the center to various countries and organizations abroad which are working in partnership with the foundation.

2) (Aid to various related undertakings)
In order to provide aid to the various types of events, seminars, joint research, research collaboration, exchange of researchers/engineers, and research cooperation through dispatching abroad highly gifted people from the Tokai Region, a financial assistance system will be bolstered, allocating set funding amounts to such endeavors. Recipients of the aid will include individuals from both the Chubu Region and overseas countries; the objective, as in the case of the appeal made to the world to support the idea of international technology exchange base, is to draw together as many talented researchers as possible.

Moreover, by tieing advanced researchers to a set period of time, it then becomes possible to expand an exchange program centering around these core researchers and to put in place a system designed to create a cluster of people with research ability.

3) (Preparation of a manual for research cooperation)
In order to obtain practical results from research collaboration, a method aimed at achieving fruitful research cooperation will be under study while, at the same time, protection of intellectual property rights will be taken into consideration. A "manual for research cooperation" based on the particular characteristics of the Tokai Region will be prepared.

4) (Dissemination of instructions)
Description of project activities of the various types of international technology exchange organizations will be distributed for instructional purposes to regional and overseas exchange partners, thereby contributing to smooth technology exchanges.

5) (Facilities for receiving researchers from abroad)
Facilities for accommodations, meals, and research laboratories will be upgraded.

6) (Conference rooms equipped with simultaneous interpreting capability)
Maintenance of conference rooms where seminars and symposiums with simultaneous interpreting capabilities may be held.

Furthermore, in working toward realization of these functions, it will be necessary to link them to various concepts currently either under study or being advanced. Especially, the concept of a large- scale technology and a science exchange center, currently under study by Aichi Prefecture, encompasses the concept designed for handling regional research exchange activities, utilizing the prefecture's advanced research resources while, at the same

time, going beyond the region to effect exchanges with the outside region's research organizations and researchers. As such, it has become a very meaningful project. It is important, therefore, to strengthen the Chubu Science and Technology Center's functions so as to complement these various concepts and enhance its activities in the context of the totality of the Chubu Region.

Proposed Expansion and Improvement in Facilities of JICA Nagoya International Training Center and AOTS Chubu Training Center

Category	JICA Nagoya International Training Center	AOTS Chubu Training Center	Remarks
Training facilities: Scale	* Sleeping Accommodations: Because of diversity of training programs, accommodations for about 200 trainees planned. Subject to further study to find appropriate scale if warranted by needs and the size of a construction site.	* Sleeping Accommodations: The basic scale-minimum of 150 trainees. Appropriate scale within the range of 300 under study if needs and a construction site warrant it, as in the case of Kansai.	
Training facilities: Site	*Partnership with local self-governing bodies should be considered. Best to select a site along public transportation lines. *Facilities should be rearranged to provide trainees living there anopportunity to become acquainted with Japanese life and culture; moreover, it is desirable to select a site in an area where such facilities as church and a shopping mall are easily accessible.	*It is desirable to select a site along public transportation lines, viz., JR Tokaido Line, Meitetsu Main Lines, etc. so that needs of companies in Aichi, Gifu, and Mie Prefectures may be met. * It also is desirable to select a site in an area where such facilities as church and shopping mall are easily accessible by trainees.	
Training facilities: Primary facilities	* Room: Equipped with bath, toilet, and telephone; also spacious. * Training facilities: Audiovisual classroom (where video projection, slides, OHP can be used), PC and typing room, resource room (books, videos, company reports, etc.), conference room, group workshop, etc. * Shared facilities: Lobby, lounge (open to outdoors). video-audio room, sports room (billiard, machine gym, squash, etc.) * Outdoor facilities: Swimming pool, tennis (basket) court, open space (lawn), etc. * Shared equipment: video camera, camera, etc.		

Overall Coordinating Agency's Projects

Major projects	Description of projects	Present policy and future directions
(1) Adjustment Project	•Creation of a framework and direction of international technology exchange. • Overall adjustments in agencies's projects and activities; also provides consultation.	• An "International Technology Exchange Committee (temporary designation) will be established and operated as an overall coordinating agency at the Chubu S&T Center.
[(2) Information Service (gathering and making available) Project	• Systematic updating and offering of technology information • Gathering and offering overseas business information • Information on laws, regulations and protection systems concerning technology exchange: gathering and offering. • Gathering and offering of information on human resources. • Socioeconomic information on the Tokai Region and international exchange-related organizations: gathering and offering.	• To construct, using as a basis a system which can organize various types of techological information maintained by each agency and which can gather and make available this information.
[(3) Aid Project]	• Aid provided for events to be held • Aid for joint research and research cooperation • Aid for sending able specialists to overseas.	• To systematize a new device for providing aid while utilizing the sources of existing aid foundations.
[(4) Project for Preparation of Manual for Research Cooperation]	• Development of a method for research collaboration	• To undertake technological developments in partnership with existing training foundations.

[continued]

[Continuation of Table]

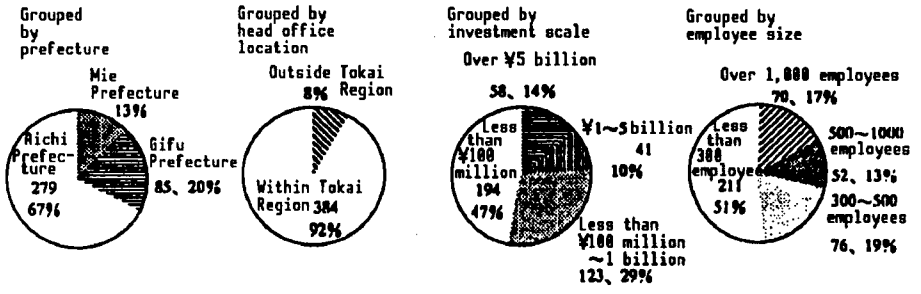
Major projects	Description of projects	Present policy and future directions
[(5) Education and Dissemination]	• PR on technology exchange projects (symposium, seminar and other types of events) • Publication of organs and research reports	• To gather and disseminate information of organizations through publication of organs.
[(6) To Upgrade Facilities for Receiving Overseas Researchers]	• Installation of lodging facilities • Installation of eating facilities • Installation of research facilities	• To install facilities by taking into consideration the upgrading of exchange facilities currently in the conceptual stage.
[(7) Upgrading international exchange conference room]	• Installation of a conference room equipped with simultaneous interpreting capabilities	• To consider holding seminars and symposiums also.

(Note: Bracketed projects scheduled for the future

Reference Materials

Survey on Advancement of International Technology Exchange and Promotion of Tokai Region's Industry and Technology: Summary and Point of Aggregate Result

1. Summary of Survey

<table>
<tr><td>Survey period</td><td>11/13/91-12/26/91 (conducted by mail)</td></tr>
<tr><td>Survey object</td><td>1) Private industry (Manufacturing, electricity, and software firms, mostly with over 200 employees (some, with over 150))
2) Business groups (cooperatives, chambers of commerce, etc.)
3) Public research organizations (including foundations)
4) Universities and colleges
5) International training organizations' trainees:
AOTS: Association for Overseas Technical Scholarship, Chubu Training Center
JICA: Japan International Cooperation Agency, Nagoya International Training Center
ICETT: International Center for Environmental Technology Transfer
• Of business firms surveyed, a list of those whose head offices are located in the Tokai Region has been compiled from data provided by Teikoku Data Bank's list of companies and the membership directory of the Chubu Economic Federation; a list of those with head offices are located outside of this region is compiled from the National Factory Survey.
• A list of industrial groups is compiled from the survey of the Chubu Bureau of the Ministry of International Trade and Industry and university catalogs; that of public research institutes, from the national directory of public research institutes; and that of universities and colleges (science and technology), prepared from university catalogs.</td></tr>
<tr><td>Targeted industries</td><td>Private industries:
<table>
<tr><td>Machinery</td><td>[680]</td><td>Materials</td><td>[285]</td><td>Other</td><td>[269]</td><td>Industrial group</td><td>[43]</td></tr>
<tr><td>General</td><td>250</td><td>Chem. plastic</td><td>58</td><td>Food</td><td>15</td><td>Public res. org.</td><td>[26]</td></tr>
<tr><td>Electric</td><td>212</td><td>Kiln, earth rock</td><td>69</td><td>Textile, cloth</td><td>71</td><td>Univ., colleges</td><td>[19]</td></tr>
<tr><td>Transport</td><td>198</td><td>Steel/non-iron</td><td>74</td><td>Wood,furniture</td><td>26</td><td>Org. trainees</td><td>[95]</td></tr>
<tr><td>Precision</td><td>20</td><td>Metal products</td><td>60</td><td>Pulp, paper</td><td>14</td><td>AOTS</td><td>43</td></tr>
<tr><td></td><td></td><td>Petroleum</td><td>24</td><td>Other products</td><td>104</td><td>JICA</td><td>42</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Software</td><td>39</td><td>ICETT</td><td>10</td></tr>
</table></td></tr>
<tr><td>Number of responses recovery rate</td><td>• Private industry: 418 firms, 34% (machinery 223, 33%; material 121, 42%; others 74, 28%)
• Industrial groups: 20, 47%; publishing research organizations: 26, 69%; universities and colleges: 9, 47%
• International training organization trainees: 95.</td></tr>
<tr><td>Composition and characteristics of responding companies</td><td> 
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2. Outline of Companies Responding to Survey

	Applicable firms	Share against total (%)	Total in real number	Applicable firms one firm average	Remarks and comments on characteristics
Number of foreign capital companies	10 firms	2.4	–	–	•3 firms with over 50% foreign capital, 50% in the machinery industry
Number of employees	409 firms	97.8	787,048 people	1,924 (people)	•Weight of giant industries large
Number of researchers	284 firms	67.9	14,719	52	•Does not include company data maintained by central research institute
Foreign researchers	21 firms	5.0	40	19	•U.S., Europe, Asia
Annual R&D spending	40 firms	9.6	¥98 billion	¥2.45 billion	•Only firms which provided data
Number of companies which have research institutes abroad	8 firms	1.7	–	–	•Chemical, ceramics, machine-related only
Number sent to overseas research institutes from Japan	4 firms	1.0	27	6.8	•Chemical industry more than half
Amount of technical trade: Export	29 firms	6.9	¥4.1 billion	¥140 million	•Only the company which provided data
Import	24 firms	5.7	¥2.7 billion	¥110 million	•72 firms exported more than they imported
Participation in ODA-related survey and development projects	11 firms	2.6	9 (persons)	0.8 (persons)	•Medical, office equipment, auto companies
Sending ODA-related specialists	10 firms	2.4	9 (persons)	0.9 (persons)	•Auto and plastic industry cooperated
Participation in Japan overseas cooperation volunteers	12 firms	2.9	9 (persons)	0.4 (persons)	•Machine tools, chemical, kiln, and electric machinery companies cooperated
Receiving technology trainees	83 firms	19.9	1,108 (persons)	13.3 (persons)	•Primarily by electric machinery and transportation machinery firms, each accepting 400
Intention of accepting technology trainees	101 firms	24.2	429 (persons)	4.2 (persons)	•AOTS 264 trainees JICA 165 trainees
Employing foreign labor force	110 firms	26.3	4,304 (persons)	39 (persons)	•Machine tool and automobile companies employ the largest number, 1,500 each.

3. Private Business Sector's International Technology Exchange

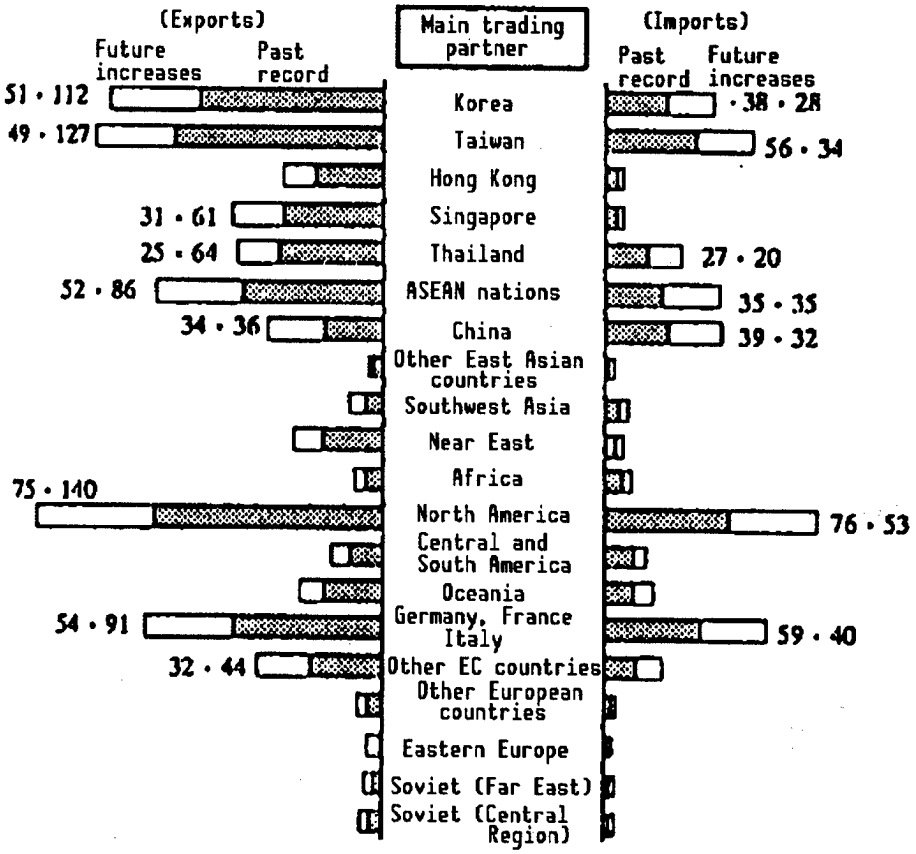
(1) Trade: Development within the four-way polarization area (Tokai, Asia, North America, Europe)

Exports: At present, 213 companies are exporting. Of those 134 firms expecting "future increases."

- In the future, the number of companies exporting to China or Eastern Europe will increase correspondingly.

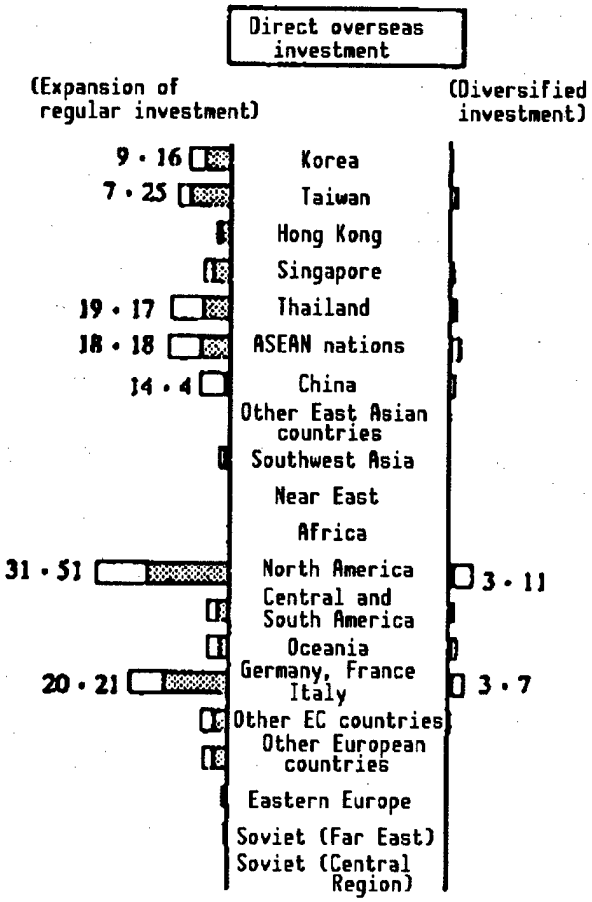
Imports: At present, 166 companies are importing. Of those, 119 companies are expecting "future increases."

- In the future, the number of companies importing from the ASEAN countries and China will increase correspondingly.



(2) Direct Overseas Investment: Trend is for continued growth

- At present, 87 companies are expanding their regular business; diversified investments undertaken by 10 firms.
- 69 firms expecting "future increases"; 19 companies plan to diversify their investments.
- Region-wise, investing in Asia, the United States, and Europe; the majority of investments made through joint ventures.
- Diversified investments to take place mostly in the United States and Europe.



3) International Technology Exchange

Definition of Terms

Introduction of Technology (importation of technology)—To receive technologies, such as patents, "know-how," technical guidance, etc. from foreign countries.

Technology Transfer (exportation of technology)—To offer technologies, such as patents, "know-how," technological guidance, etc., to foreign countries.

Technical Cooperation—To assist foreign countries while abiding by their domestic and international policies and through technology transfer and support.

Technical Training—Accepting trainees desirous of acquiring technological skills and knowledge.

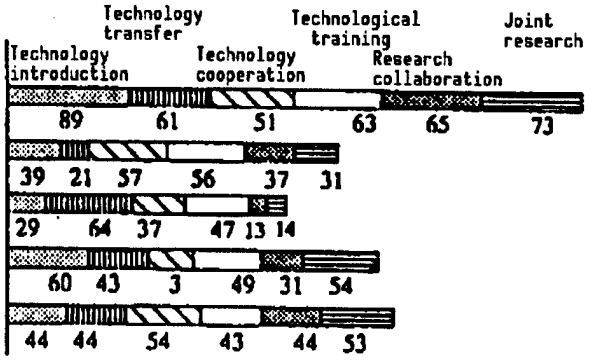
Research Collaboration—To support foreign countries' R&D efforts while cooperating with their domestic and foreign policies and measures.

Joint Research—Joint R&D efforts with both parties working along the same theme for mutual benefit (other than those included in the category of research collaboration).

A. Approach to International Technology Exchange (including 14 industrial groups)

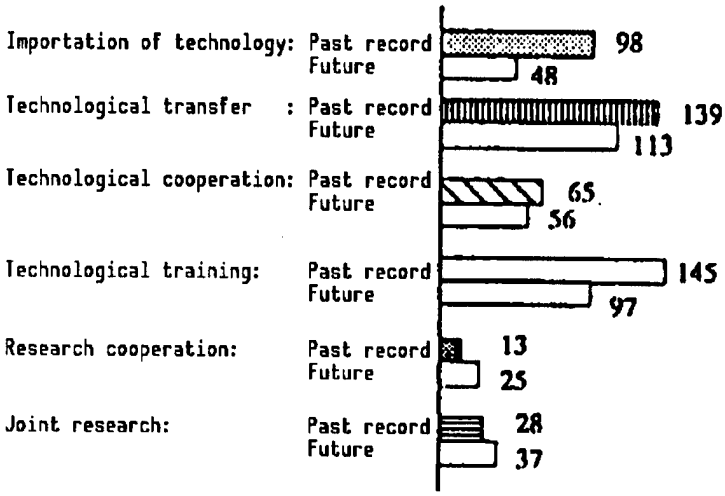
• Those who responded that international technology exchange is not necessary can be broken down as follows: 51 (technical cooperation) and 89 (importation of technology).
• As for technology transfers, 64 said, "in the future, international technology transfer will increase."

a. Domestic technology exchange alone is sufficient; no need for international exchanges.
b. Although respondents did not feel international exchange was necessary, if the public sector will provide support, they would like to try it out.
c. In the future, respondents felt that international technology exchanges will surpass domestic exchanges.
d. Although the 'weight' of international technology exchange is greater, domestic exchange still plays a central role.
e. Although respondents were motivated, they felt that it would be difficult to become involved in international technology exchange.



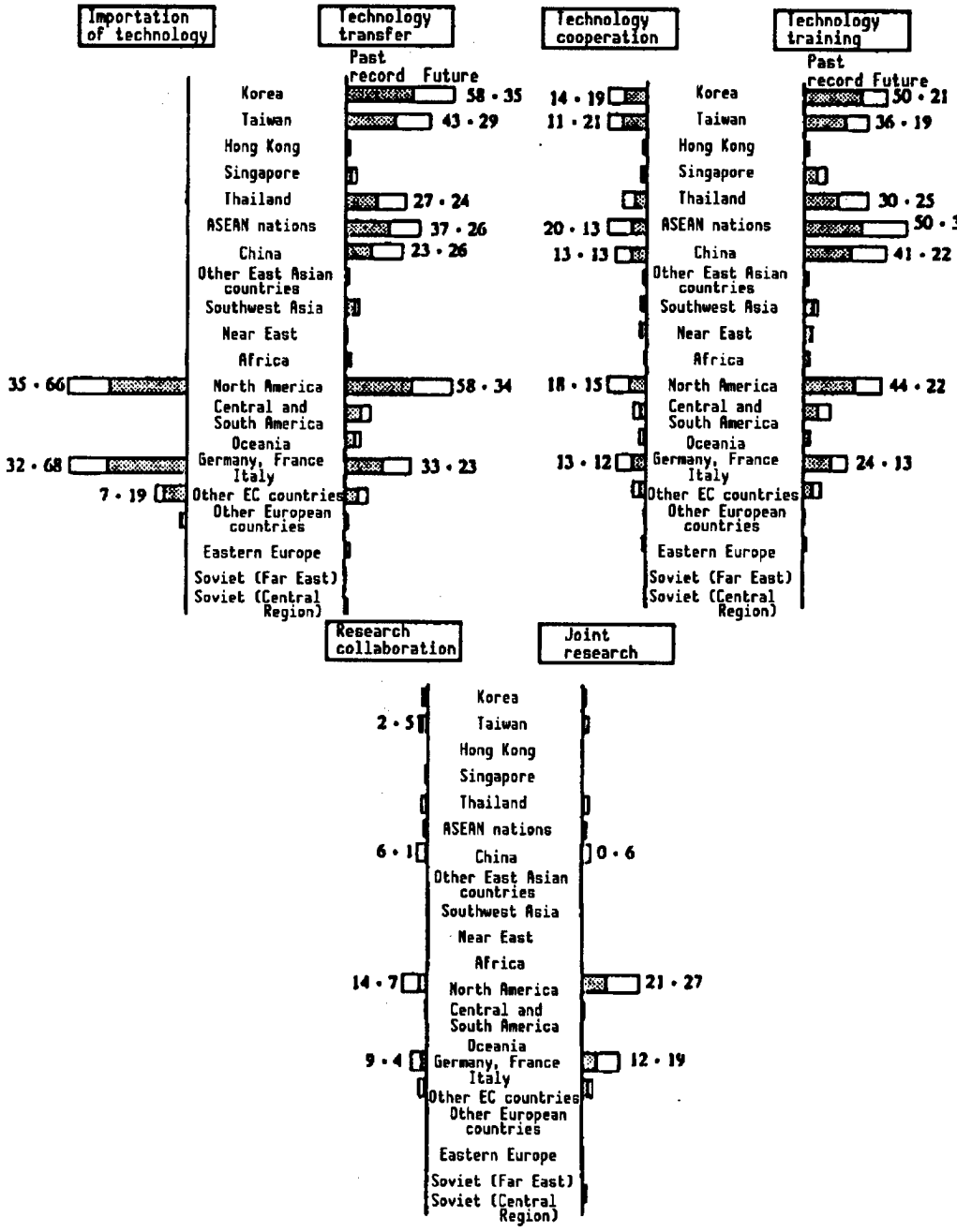
B. Past Performance of International Technology Exchange and Anticipated Future Increases (Respondents were asked to limited their choice to five or fewer number of main categories)

• Past performance was ranked in the order of technical training, technology transfer, and technical cooperation.
• "Future increases" were ranked in the order of technology transfer, technical training, and technical cooperation, with the latter two categories moving up.
• Although the numbers in research collaboration and joint research were small, their numbers increased noticeably in the "future increases" column.



C. Past Record and Future of International Technology Exchange (Respondents were asked to choose five or less answers to main questions)

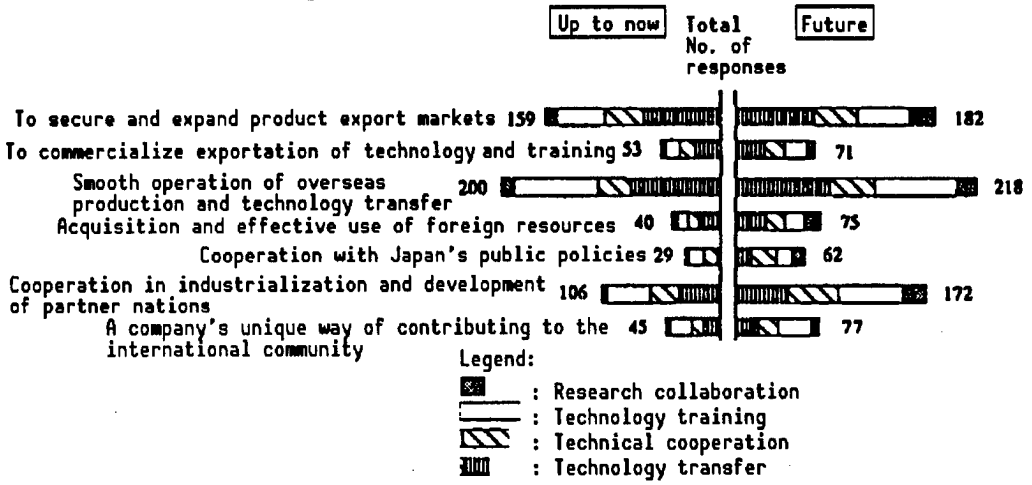
- Technology transfers center around Asia NIES, ASEAN nations, China, the United States, and Europe, while the importation of technology and research exchange center around the United States and Europe.
- Although statistical data reflect decreases in exports and in overseas market entry, a trend for future increases indicate an overall shift toward Thailand, ASEAN nations, and China.



D. Primary Objectives of Technological Transfers (Respondents were asked to indicate all their main choices)

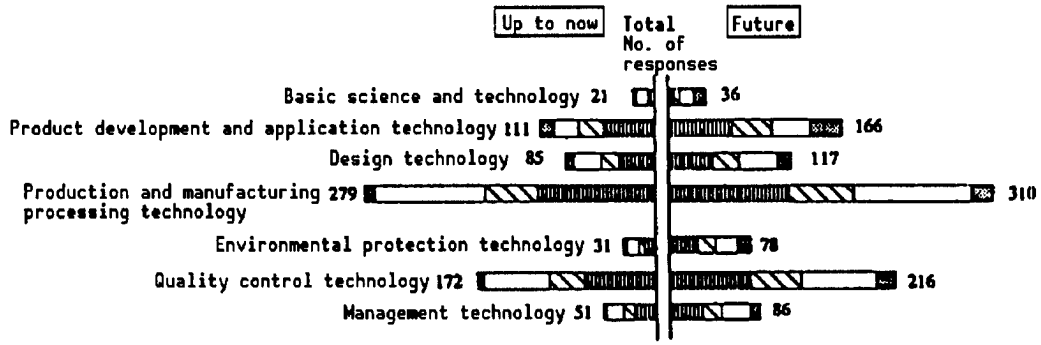
1) Major objectives

- Emphasis has been on ensuring the market and the smooth operation of overseas production
- For the future, a noticeable number of respondents chose international contributions through technological transfer as their primary objective.



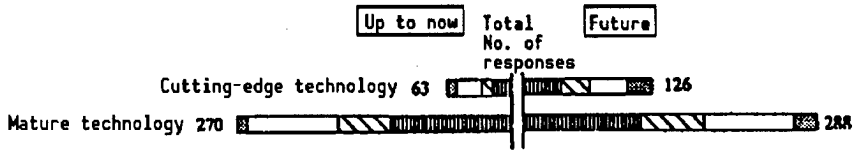
2) Contents of exchange technology

- The majority indicated production/manufacturing process control and quality control technologies as their primary goals.
- The foremost choices of an increased number of respondents were technology transfer, product development, application, environmental protection, and management technologies.



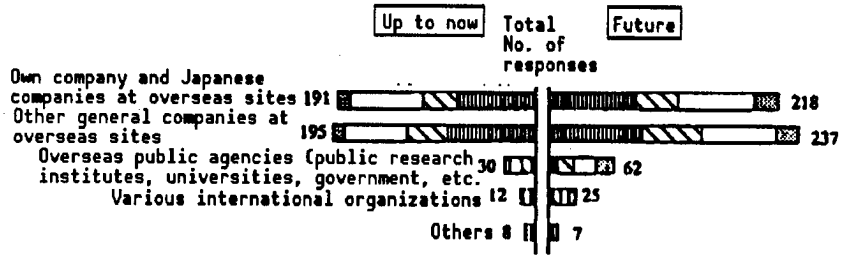
3) Technological level

- For the future, the foremost choice of an increased number of respondents was cutting-edge technology.



4) Exchange partners

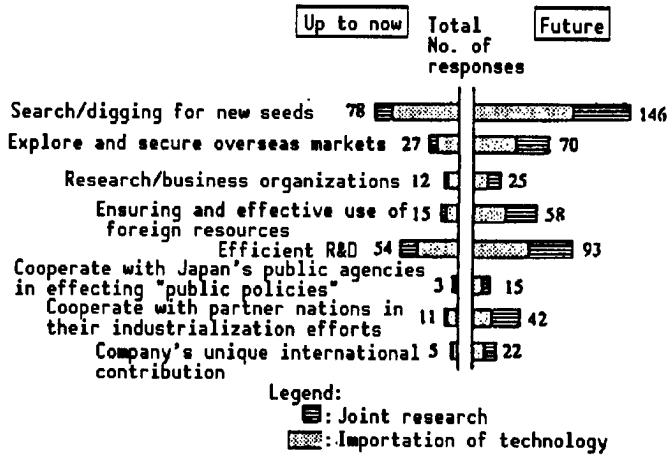
- Exchange among business corporations holds a central position.
- For the future, an increased number cited exchange with overseas public organizations.



E. Primary Objectives of Exportation of Technology and Joint Research (Respondents were asked not to limit themselves to only one choice of the category)

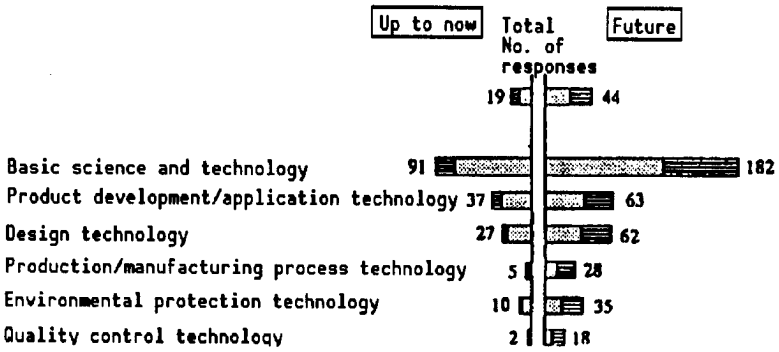
Primary Objectives

- To search for and dig out new technological seeds useful in attaining efficient R&D.
- For the future, noticeably more people cited effective use and procuring of foreign resources or international contributions as their primary objective.



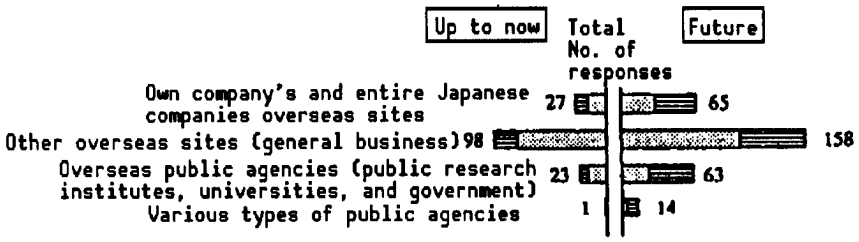
Content of Technology Exchange

- Product development, application technology, and design technology.



Partners in Technological Exchange

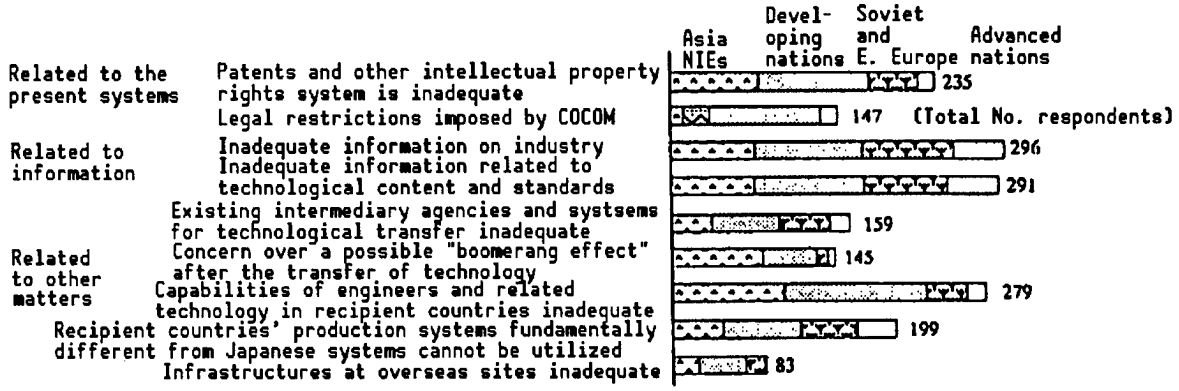
- Importation of technology from and joint research with foreign companies.
- For the future, noticeably more people cited joint research with foreign companies as their means of technological exchange.



F. Problems concerning International Technology Exchange (Includes from 10 to 21 industrial and other types of organizations; they were asked to limit the number of their choices to less than 10)

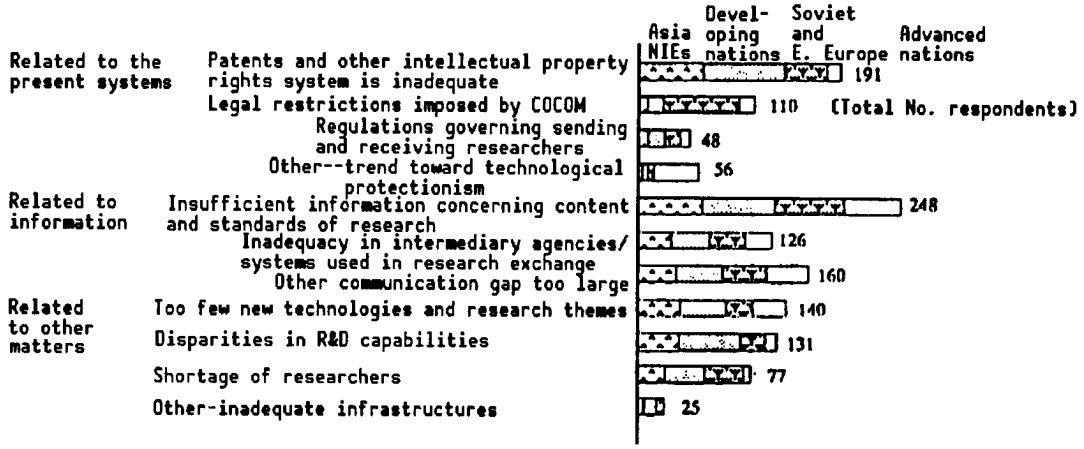
Problems Associated with Technological Transfer

- Problems largely associated with developing nations are concentrated in two areas, viz., the lack of available information and related technologies.
- Especially noticeable were responses expressing concern over the problem of intellectual property rights and, in Asia NIES, the boomerang effect.
- Regarding problems associated with the Japanese side, 29 companies cited the shortage of engineers and technicians whom they can send abroad following the exportation of plants.



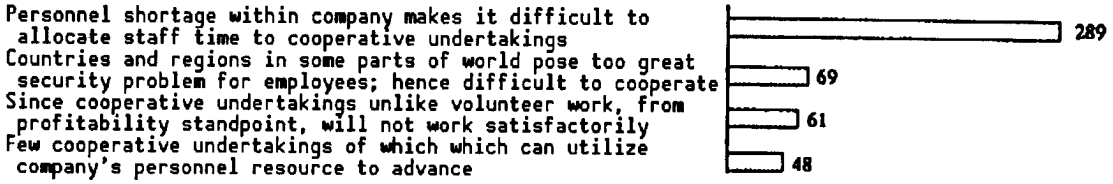
Problems Associated with Importation of Technology and Joint Research

- Although some alluded to the problem of intellectual property rights, most cited the lack of research-related information as a problem.
- Disparities in the levels of technology between Japan and developing nations also are cited as a problem.
- The tendency of advanced countries toward technological protectionism was cited as a problem.
- The foremost problem faced by Japanese companies is the shortage of researchers, followed by the problem of inadequate aid allocated to research exchange.



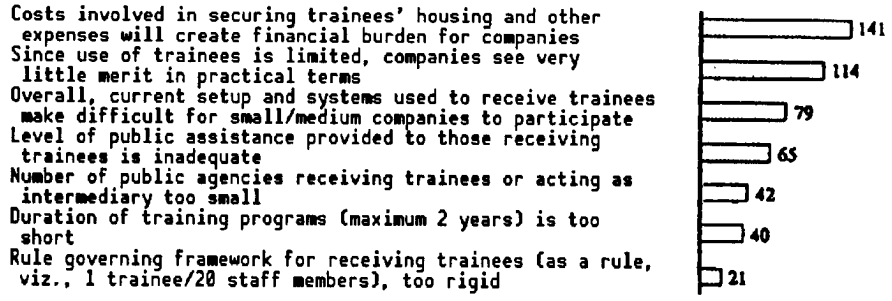
G. Problems Concerning International Technological Cooperation, Technical Training, and Research Collaboration (Five or less items which especially create a great deal of problem: industrial groups included among respondents)

Problems concerning cooperation with ODA and others: as for shortage of quality personnel, the response of those companies whose head offices are located outside the region was especially high (over 90%).

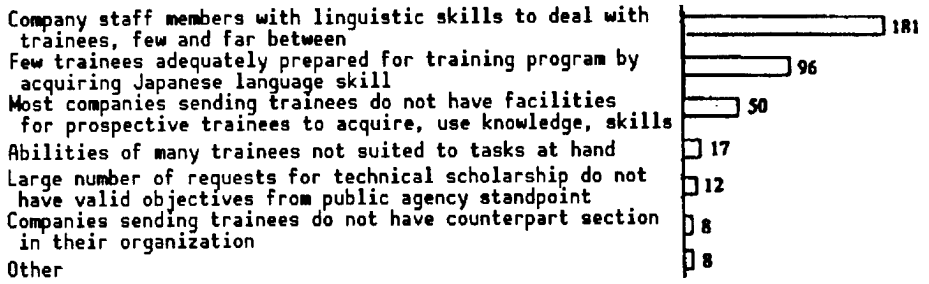


Problems of receiving technical scholarship trainees:

- The response rate of companies with capital of over ¥10 billion, citing the problem as a "financial burden," was somewhat high.
- The response rate of companies with capital of less than ¥100 million~ ¥1 billion citing the problem as "program has no merits" was relatively high.
- The response rate of companies with capital of less than ¥100 million citing the problem as, "it is difficult for small/medium companies to offer training programs," was high.

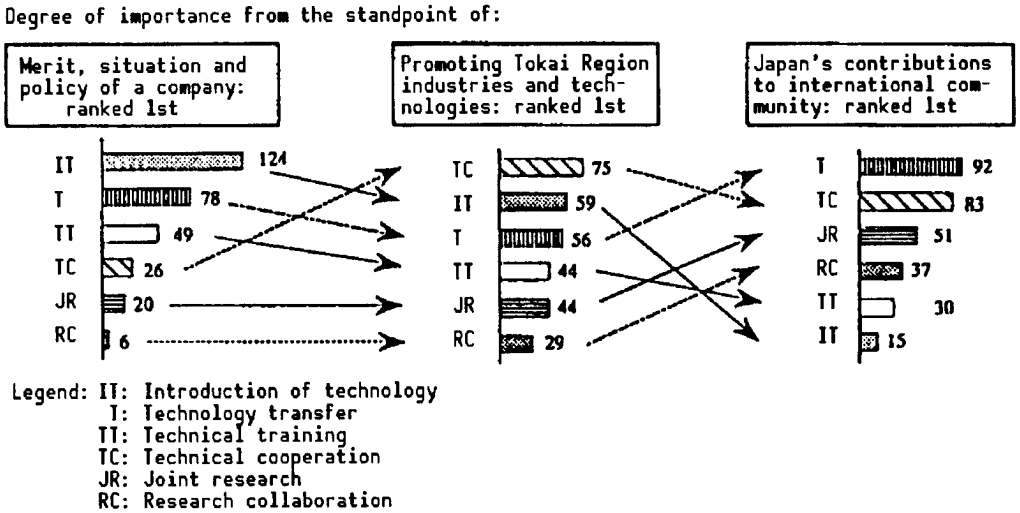


Other Problems: The response rate of companies located outside the region citing a shortage of people with linguistic ability as a problem was somewhat lower. When analyzed in terms of company scale, the response rate of those with capital of less than ¥100 million and with fewer than 500~1,000 employees was relatively high.



H. Degree of Importance and Priorities Considered in Advancing International Technology Exchanges (various business groups included)

- Priority varies greatly depending on standpoint and policy of companies involved.
- The response rate of companies with capital of ¥100 million~1 billion, citing strong motivation from company's viewpoint for importation of technology (technology transfer ranks first with companies with their head offices are located outside of the region) was especially high.
- Because technical cooperation is closely related to the promotion of regional industries, the response rate in this category ranked high among companies with a capital more than ¥1 billion and employing more than 1,000 workers.
- As for the category of international contributions, many companies with outside-the-region head offices chose technology transfer as the most important item. Of companies with head offices located within the region, a relatively high response rate in favor of technological transfer was obtained from those with a scale of investment exceeding ¥5 billion.

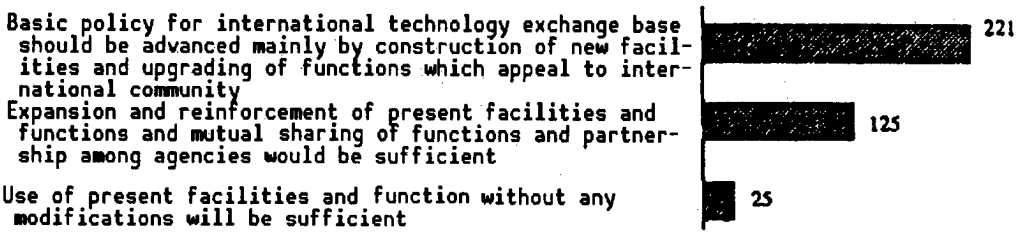


4. Basic Underlying Policy and Measures To Be Taken in Establishing an International Technology Exchange Base in the Tokai Region

(1) Basic Policy for Building a Technology Exchange Base (37 organizations, including industrial groups, universities, and public research institutes)

- To the question of whether new facilities should be added and existing ones upgraded, the response rate of companies (plants) whose head offices are located outside of the region was somewhat low. In terms of types of industries, the response rate of machinery and other industries was high.

- In terms of the scale of companies surveyed, the response rate of those with capital ranging from ¥1 billion to ¥10 billion and with from 300 to 500 employees as well as those employing over 1,000 was relatively high.



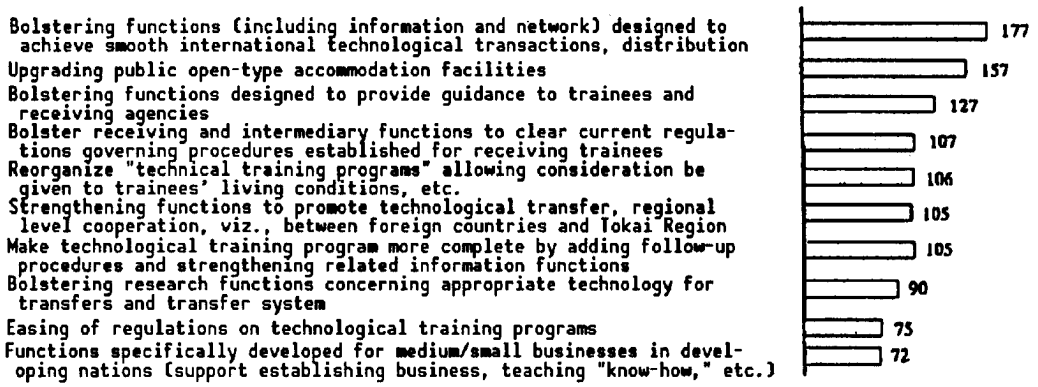
(2) Items with High Degree of Importance in Establishing the Exchange Base (Respondents were asked to select four or fewer primary items: Respondents include industrial groups, universities, and public research institutes)

Important Items Concerning Technology Transfer, Technical Cooperation, and Technical Training

- Concerning "smooth operation" functions, a high response rate was obtained from companies with head offices located outside of the region and with capital of from ¥1~10 billion and employees numbering from 500 to 1,000.

- As for "accommodation facilities," the following elicited a high response rate: companies whose head offices are located outside of the region; in terms of type of industry, materials industry; and, in terms of company scale, large corporations with a capital of over ¥10 billion and employees numbering over 1,000.

- Concerning "training guidance" functions, the following had a high response rate: companies with head offices located outside of the region; in terms of the type of industry, materials industry; and in terms of company scale, large corporations with capital over ¥10 billion and with over 1,000 employees.



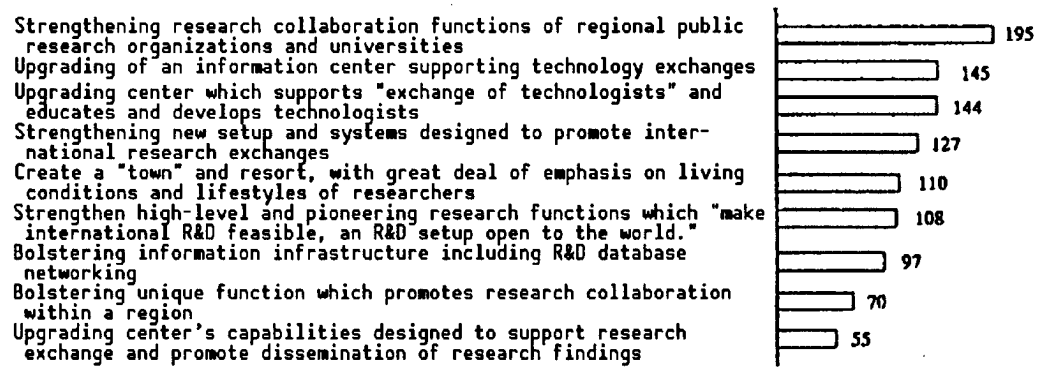
Important Items concerning Common Features of Research Cooperation and Joint Research

• With respect to "research collaboration" functions, a high response rate was obtained from the following: companies whose head offices are located outside of the region; in terms of types of industries, materials industry; and scale-wise, companies with capital of over ¥19 billion and employees numbering between 500 and 1,000.

• With respect to the question of the "technology exchange information center," a relatively high response rate was obtained from the following: industry-wise, the material industry; company scale-wise, those with capital of less than ¥100 million and with fewer than 500 employees.

• With respect to the "development center for engineers and technicians," a relatively high response rate was obtained from the following: companies with head offices located outside of the region; industry-wise, the materials industry; and scale-wise, companies with capital of ¥100 million~1 billion capital and with fewer than 500 employees.

• With respect to the new setup for international research exchange," a relatively high response rate was obtained from the following: the region's public research institute, universities, and industrial groups; industry-wise, other industries; and scale-wise, companies with from ¥1 million~1 billion in capital.

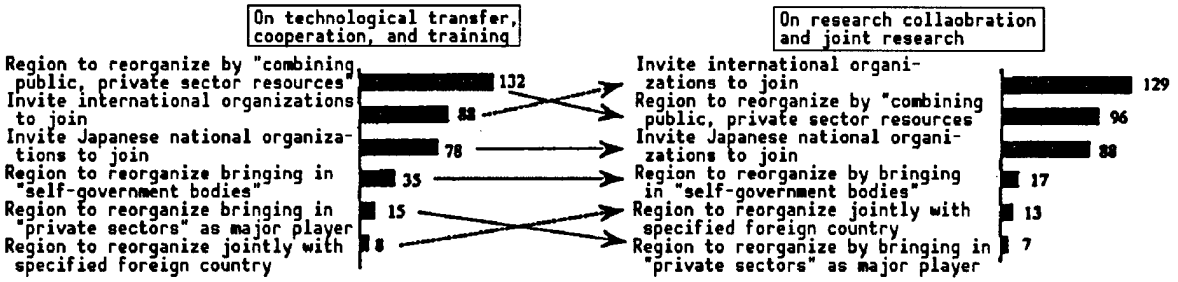


• The items of importance in forming an international technology exchange base, when ranked according to priority, show the following results insofar as the first-ranked items are concerned: "smooth operation of functions," "easing of regulations imposed on technological training," and "strengthening of international pioneering research functions."

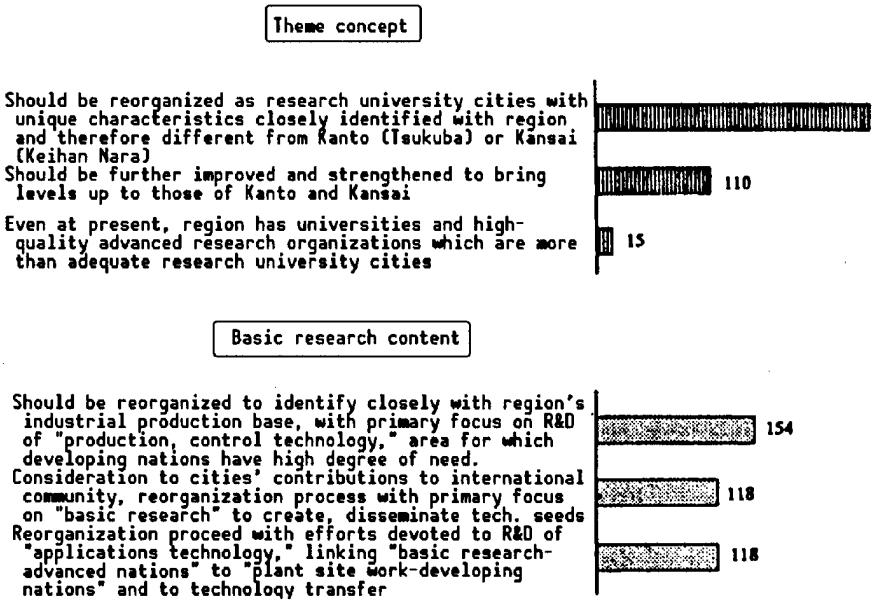
(3) The Degree of Importance and Priority of Specific Policies for Formation of the International Technology Exchange Base (include groups)

• With respect to "Combining Public and Private Resources to Go Forward," the item ranked first in the area of technology transfer, the following response results were obtained: a high response rate was obtained from companies with capital of ¥1 million~1 billion and with employees numbering 300-500; with companies with capital of over ¥10 billion, the need of inducing international organizations to participate ranked first.

• With respect to the area related to research exchange, first-ranked "inducing international organizations to join" received a high response rate from companies with over 1-billion yen capital and 1000+ employees.



(4) Research University Cities (Nagoya Eastern Hill, Eastern Mino West, and Suzuka): Directions for Reorganization



5. A Surveys of Trainees of International Training Agencies

1. Countries and regions:

Korea and Singapore—20 (18, 1)
ASEAN Countries—17 (Thailand 8, Malaysia 3, Indonesia 4, Philippines 2)
Other Developing Nations—23
(3: Egypt, Turkey, Brazil; 2: Iran 2; Mexico, Pakistan; 1: Syria, India, Sri Lanka, Tanzania, Omali, Ghana, Malawi, Uganda)
Eastern Europe 10 (Poland and Hungary, 5 each)

2. Duration of training—1 month, 12.6%; 3 months, 24.19%; 6 months, 35.8%; and over one year, 27.4%.

3. Their needs to be met by technology transfer

4. Evaluation of training in Japan and attendant problems (satisfaction level or adequacy):

- Over 80%: "sufficient understanding of the content of the training" (87%) "the fact that, after training, a trainee will have a job waiting for him, in which he can utilize his newly acquired skills" (80%: when duration of training is longer, response rate is somewhat lower)

- Over 70%: living space (71%); enjoyment of leisure time away from training (71%); made friends (71%); 86% of their friends have some Japanese friends.

- Over 60%: content of training matches trainee's needs (66%) time spent on general and theoretical training (64%)

- Over 50%: meals served (57%); training time spent at a plant site or in performing actual work (64%)

- To the question of whether trainees have sufficient understanding of the Japanese language, 88% of them responded with "No."

	Korea Singapore	ASEAN Nations	China	Other Developing Nations	Eastern Europe Poland Hungary
Most important industries in country's industrialization	1) software 2) precision equipment 3) electronic equipment 4) casting, die, etc. 5) electronic parts	1) food 2) kiln, rock/earth 3) general machinery 4) textile 4) metals for construction use 4) software	1) electronic equipment 2) food 3) software 4) petroleum products 4) basic metals 4) precision equipment	1) food 2) basic metals 2) casting, die, etc. 4) electric equipment 4) electronic equipment 4) electronic parts	1) electronic equipment 2) food 2) precision equipment 4) other chem. products 4) general machinery 4) electric equipment 4) automobile assembly
Industries creating expectations for technological transfer from Japan	1) software 2) precision equipment 3) electronic equipment 4) electronic parts 5) casting, die, etc.	1) general machinery 2) electronic equipment 3) food 4) kiln, rock/earth 5) electric equipment	1) electronic equipment 2) precision equipment 3) software 4) electric equipment 5) automobile assembly	1) electronic equipment 2) food 3) casting, die, etc. 4) electric equipment 4) electronic parts 4) software	1) automobile assembly 2) electronic equipment 3) precision equipment 4) plastic 4) automobile assembly
Technologies creating expectations for transfer from Japan	1) quality control 2) product development 3) basic chemical technology 3) design	1) product development 2) production, manufacturing 3) quality control 4)environmental protection	1) management 2) quality control 3) production, manufacturing 4)environmental protection	1) production, manufacturing 1) quality control 3) product development 4) design	1) environmental protection 2) production, manufacturing 2) quality control
Form of technological transfer from Japan creating expectations	1) joint research 2) sending experts 3) research cooperation	1) joint research 2) joint venture 2) dispatching experts	1) joint research 2) 100% direct investment	1) joint venture 2) supply of facilities 3) joint research	1) joint venture 2) license production 3) research cooperation
Type of people who should receive training in Japan	1) private corporation engineer 2) private corporation middle management 3) private corporation field worker	1) government official 2) public sector engineer 3) private sector engineer	1) public corporation engineers 2) public corporation top management 3) government officials 3) local government officials	1) private corporation engineers 2) public corporation middle management 3) government official	1) local government officials 2) public corporation middle management 2) private corporation middle management

- END -

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